DOCUMENT RESUME

ED 120 520 CE 006 827

AUTHOR Schiller, Bradley R.
TITLE Internal and External Labor Markets: An Analysis of Manpower Utilization.
INSTITUTION Maryland Univ., College Park. Dept. of Economics.
SPONS AGENCY Manpower Administration (DOL), Washington, D.C. Office of Research and Development.
REPORT NO DOL-21-24-74-26
PUB DATE 21 Nov 75
NOTE 90p.; Not available in hard copy due to marginal reproducibility

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS *Fringe Benefits; Industrial Relations; *Labor Market; Labor Turnover; Manpower Utilization; *Occupational Mobility; *Retirement; *Salary Differentials; Socioeconomic Status; Wages
IDENTIFIERS Pension Plans

ABSTRACT

The report covers two major topic areas, each of which is treated in a separate paper: (1) the extent of variation in individual workers' relative earnings, and (2) the impact of private pension plans on firm attachment. The first study looks at changes in relative earnings and evaluates them in the framework of alternative labor market models. It concludes that workers tend to leave their employer less as vesting status or retirement eligibility approaches and that higher wages generally tend to inhibit exit. The second study attempts to measure the extent to which firm exit is constrained by specific provision (such as vesting) of private pension plans. It concludes that the size of monthly benefits acts as a powerful determinant of firm attachment patterns, with higher monthly pension benefits tending to reduce firm exit rates among those approaching retirement eligibility and to increase exit rates for those already eligible for retirement. Both studies use the Social Security Administration's LEED data file. (Author/JR)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

APR 12 1976

ED120520

UNIVERSITY OF MARYLAND
College Park 20742

Department of Economics

CE

Internal & External Labor Markets:

An Analysis of Manpower Utilization

(DOL Grant No. 21-24-74-26)

Final Report

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

submitted to:

Office of Research & Development
Employment & Training Administration
U.S. Department of Labor

by:
Bradley R. Schiller
Economics Department
University of Maryland

November 21, 1975

CE006827

This report was prepared for the Manpower Administration, U.S. Department of Labor, under research and development contract (grant) No. 21-24-74-26. Since contractors (grantees) conducting research and development projects under Government sponsorship are encouraged to express their own judgment freely, this report does not necessarily represent the official opinion of policy of the Department of Labor. The contractor (grantee) is solely responsible for the contents of this report.

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2	3. Recipient's Accession No.
4. Title and Subtitle: Internal and External Labor Markets: An Analysis of Manpower Utilization			5. Report Date: November 21, 1975 6.
7. Author(s): Bradley R. Schiller			8. Performing Organization Rept. No.
9. Performing Organization Name and Address: Department of Economics University of Maryland College Park, MD 20742			10. Project/Task/Work Unit No. 11. Contract/Grant No.: DOL/MA 21-24-74-26
12. Sponsoring Organization Name and Address: U.S. Department of Labor Manpower Administration Office of Research and Development 601 D Street, N.W., Washington, D.C. 20213			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

The study includes two major topic areas: (1) the impact of private pension plans on firm attachment, and (2) the extent of variation in individual workers' relative earnings, and separate papers on each of these topics are incorporated in the final report. The first study attempts to measure the extent to which firm exit is constrained by specific provisions (e.g. vesting) of private pension plans. The second looks at changes in relative earnings and evaluates them in the framework of alternative labor market models. Both papers use the Social Security Administration's LEED data file.

17. Key Words and Document Analysis. 17a. Descriptors

Earnings
Fringe Benefits
Mobility
Retirement
Socioeconomic Status
Industrial Relations

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group: C, I

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Distribution is unlimited. Available from National Technical Information Service, Springfield, Va. 22151.	UNCLASSIFIED	
	20. Security Class (This Page) UNCLASSIFIED	22. Price

FORM NTIS-35 (REV. 3-72) THIS FORM MAY BE REPRODUCED USCOMM-DC 14952-P72

I. Introduction:

This report summarizes research activities carried out under DOL Grant No. 21 - 24 - 74 - 26. Although our research has encompassed a broad range of questions relevant to manpower utilization patterns, most of our resources have been devoted to one specific subject, namely the impact of private pension plans on manpower utilization. What resources remained were largely used to explore the extent of individual movement over time within the personal distribution of earnings. Accordingly, this report provides a sketch of how our work evolved, the kinds of data acquired, the issues identified for a more complete research agenda, and highlights of findings from our two major studies. More complete descriptions of the activity and results of our two major studies are contained in the separate papers which we have appended to this report and regard as integral elements thereof.

The Principal Investigator for this study was Dr. Bradley Schiller, Dr. Randall Weiss was the Associate Investigator, while Donald Snyder and William Sutton were the principal research assistants. Others who contributed significantly to the study include Wayne Vroman, William Bowman, Shelley Lapkoff, John McNary, Sheldon Gnatt, Deborah Agus, John Gates, Evan Schaffer, Robert Long, Michael Laufer, and Janet Rentz.

II. Background:

The mechanisms and potential for more effectively utilizing our labor resources are subjects of long-standing interest. Of fairly recent interest, however, are the differential patterns of labor supply

utilization associated with particular groups of workers, industries, or employer types. Only in the last few years, for example, have extensive inquiries been undertaken to determine the patterns of mobility experienced by disadvantaged groups and the nature of the obstacles which impede their human capital development and utilization. Of even more recent interest is the nature of training and training impact in different institutional contexts and what institutional mechanisms affect such patterns. All of these interests are reflected in current labor market policy initiatives.

In assessing the evolution of these research and policy interests we may note that increasing attention has been focused on microeconomic phenomena. This shift of interest has occurred for two reasons. First, recognition of the fact that macroeconomic shifts depend on microeconomic adjustments has grown. Second, we have come to realize that policy intervention at the microeconomic level is often the most effective and accessible mechanism for inducing desired labor market outcomes.

Spurring interest in microeconomic phenomena are the results of early labor-group-specific, firm-specific, and industry-specific studies. Doeringer and Piore, for example, were among the first to call special attention to the unique properties of what they termed internal labor markets. According to their analysis, labor supply and utilization behavior within a firm are constrained by a separate and unique system of entry, seniority, career pattern, and retirement guidelines. Thus, internal labor markets can both withstand shocks from the external (or general) labor market and also influence developments in the market. As a consequence, we must know how internal labor markets

behave if we are to understand and help shape labor supply utilization patterns.

One of the continuing constraints on further work in this area has been the difficulty of assembling meaningful data on longitudinal experiences of individual workers, firms, or employer-types. Few firms retain complete records on the mobility of individual workers over extended periods of time. Where they are maintained they are not always available or are accessible only at considerable cost. Even greater obstacles have impeded the study of external labor market patterns of mobility. In a word, longitudinal data have been scarce.

What makes more complete analysis now possible is the long-awaited availability of the longitudinal Employer-Employee Data (LEED) file compiled by the Social Security Administration. With this sample it is now possible to examine mobility patterns in internal and external labor markets in great detail. We can determine, for example, the extent of employer attachment for different groups of workers in different employment contexts. We can also determine to what extent employer attachment leads to more intensive human capital development, as reflected in an employee's earnings mobility.

In recognition of this convergence of policy interests and data sources, we proposed to begin an exploration of the LEED file, by utilizing it to address issues of immediate policy concern. With the support of the Office of Manpower Research and Development we undertook the specific task of determining how private pension plans have altered firm attachment patterns, i.e., the question of whether or not a worker's

decision to remain with a particular firm is influenced by the characteristics of the firm's pension plan. A second major study was designed to determine the extent of change (or mobility) in individual earnings over the typical work life, an inquiry which could provide the foundation for more comprehensive analysis of specific manpower utilization patterns (e.g., manpower training). The nature and content of these two studies are described in the following sections, along with their principal findings. The last section describes some of our additional activity and a suggested research agenda.

III. The Pension Study

The primary objective of the pension study was to determine the extent to which private pension plans influenced the firm attachment decisions of individual workers. Interest in this subject was based not only on a general concern for labor market efficiency but also on Congressional passage of the Employee Retirement Income Security Act (ERISA) of 1974. If workers' attachment decisions are significantly influenced by pension plan characteristics, then the efficient allocation of labor resources may be impaired. On the other hand, if firm attachment is significantly increased by 'liberal' pension plan characteristics, then firms may be less reluctant to comply with the objectives and requirements of ERISA, thereby assuring workers more income security. Accordingly, we sought to determine how specific characteristics of private pension plans -- particularly vesting, retirement eligibility, and benefit levels -- altered individual attachment decisions.

A. Data and Methodology

In order to ascertain the nature of these relationships, we needed both (1) a longitudinal record of individual employee attachments and (2) a description of the pension plans available to the employee at each employer. The former need was satisfied by the LEED file, but the latter required supplementary data collection. Details on the characteristics of private pension plans were gathered from the public files maintained by the Labor & Management Services Administration (LMSA) of the U.S. Department of Labor. This required intensive use of project manpower, for the purpose of finding, then coding information from each firm's file. Pension plan characteristics were assembled for nearly 300 firms.

By matching individual workers with our sample of firms for which we had assembled pension data, it was possible to relate attachment decisions to pension plans. By identifying important differences in the characteristics of such plans, it became possible to relate differences in attachment patterns to differences in pension plans, an exercise that was the principal focus of our inquiry. The effort was carried out in a multivariate framework, itself based on an analytical model which we developed.

B. Principal Findings

Our analysis of the relationship between pension plan characteristics and firm attachment patterns clearly demonstrates that pension plans are an important determinant of firm exit rates. In general, we found that the promise of vesting, retirement eligibility, and higher benefit

levels tends to increase firm attachment (reduce exit rates) among workers approaching such status while the attainment of retirement eligibility significantly reduces attachment (increases firm exit).

Because we have tried to measure the impact of specific pension plan provisions on specific age cohorts, it is difficult to summarize all of our significant findings. However, we can describe some of the highlights. With respect to inter-firm comparisons, we found, for example, that the availability of a standard vesting option (available between the ages 40-44; typically, age 40 with 10 years of service) tends to reduce a firm's exit rate by 4.24 percentage points below that which would exist in the absence of a vesting option. The holding power of the standard vesting option is strongest for younger cohorts, as is manifest by the 6.09-point drop in the exit rate of the cohort age 35-39. These are very substantial impacts, particularly in view of the fact that the <u>average</u> annual firm exit rate we observed was only 10 percent.

The promise of higher monthly pension benefits tends to reduce firm exit rates among those approaching retirement eligibility (age 55-61), by an average of .02 percentage points for every added dollar of monthly benefits. For those already eligible for retirement, however, each added dollar of benefits <u>increases</u> firm exit by .11 percentage points. Thus, the size of monthly benefits acts as a powerful determinant of firm attachment patterns.

Our findings for firms are mirrored in our findings for individual workers. The probability of an individual worker leaving his employer

drops as vesting status or retirement eligibility approaches. Once either early or normal retirement eligibility is attained, however, the probability of exit jumps by as much as .28.

We also noted that wages are an important influence on individuals' exit decisions, with higher wages generally inhibiting exit. But we also observed that the promise of higher pension benefits can be more effective than higher wages in holding a worker to his employer. Among men aged 55-61, for example, a $3.00 increase in promised monthly pension benefits appears to restrain exit as much as a $1,000 increase in current annual salary.

C. Policy Significance

Our findings on the impact of private pension plans on firm attachment tend to underscore the importance of pension plan reforms. Clearly, more "liberal" private pension plans will diminish labor mobility, especially among prime-aged workers. This impact may impair labor market efficiency, and thus lead to loss of potential output. To reduce such inefficiencies, pension benefits would have to be less tied to individual firms, either by substituting public for private plans or by increasing the portability of accumulating private pension rights.

From a private employer's perspective, however, firm-specific pension plans appear to offer some important advantages. First,of all, firms possess the potential to alter voluntary attachment decisions by altering pension plan characteristics. Secondly, it appears that the added costs of more generous pension plan provisions can be at least partially recouped from the cost savings associated with reduced employee turnover.

IV. The Relative Earnings Mobility Study

The second principal inquiry undertaken by the research project was an exploration of mobility patterns in the personal distribution of earnings. A great deal of research on labor markets and manpower programs has suggested that short-run changes in earnings are commonplace. But at the same time, other research has demonstrated that the shape of the personal distribution of earnings is relatively rigid. Together, these observations suggest that either (1) there is a lot transitory variation in earnings, with no significant, longer-term changes in relative status, or (2) that there is extensive, longer-term ("permanent") mobility between points of the earnings distribution.

Clearly, resolution of these alternatives is of immediate relevance to a host of manpower issues, among them the utility of and pay-off to manpower training. If income changes are transitory in character, then there is no reason to believe that manpower training 'pays' (or that previous, short-run evaluations are meaningful). On the other hand, if significant, 'permanent' earnings changes are both possible and prevalent, then manpower training efforts would appear to be well-founded.

The immediate focus of this study, then, was the extent of mobility (change) in individual earnings over the typical working life.

A. Data and Methodology

The LEED file was ideally suited for this inquiry, as it not only details the earnings of an individual worker over time (1957-71), but

also provides the data from which entire earnings distribution can be constructed. The first task of the study was to construct such distributions for each year of the observation period, for all covered males. By partitioning each distribution into twenty proportional, hierarchical segments ("ventiles"), it became possible to assign each individual to a rank in any given year's earnings distribution. The critical research and policy questions was then formulated in these terms, i.e., do people change ranks over their working lives?*

Because earnings levels are heavily influenced by the length of work experience, it was deemed desirable to distinguish between that amount of earnings mobility attributible to age differentials and that attributible to differences in the content of work experience. The really important issues addressed by this study focused on the latter kinds of mobility, i.e., that brought about by specific training, occupational, or industry choices. Hence, we revised the methodology to highlight such changes, a procedure which involved constructing separate earnings distributions for each five-year age cohort in every year. Thus, our measure of status became an individual's rank ("cohort ventile position") in the earnings distribution unique to his age cohort; our measure of earnings mobility was the change in that rank.

Predictions of what observed mobility patterns might look like were developed on the basis of several well-known models of the labor market. The inquiry then focused on comparing actual patterns of mobility to such predictions, a procedure which not only provided a

*It should be noted that this procedure automatically adjusts for inflation and changes (if any) in the shape of the size distribution of earnings.

more substantive basis for interpreting mobility experiences, but also tested the validity of alternative theoretical models.

B. Principal Findings

The salient finding of our study was that relative earnings mobility is pervasive, with over 70 percent of all workers changing (cohort) earnings ranks over a fifteen year period. The average distance of such moves was 4.22 ventiles, or approximately one-fifth (21 percentiles) of the way across the earnings distribution. Moreover, earnings mobility appears to be a phenomenon which is common to all age groups.

There are discernible exceptions, however, to the general pattern of extensive relative earnings mobility. First of all, we have noted a tendency for black males to be less mobile, and even more markedly, a tendency for them to fall further and more frequently from higher earnings ranks, once attained. These observations suggest a strong element of discrimination, and are particularly disturbing in view of the years covered (1957-71).

The second exception to the general pattern of mobility occurs at the extremes of the earnings distribution, with workers in the lowest and highest ranks exhibiting significantly less mobility than everyone else.

C. Policy Implications

The extensive relative earnings mobility we have observed provides strong support for the notion that training mechanism are an important

determinant of earnings profiles, i.e., that longterm changes in earnings capacity are both possible and prevalent. In particular, our examination of alternative labor market models seems to suggest that on-the-job training models can best predict observed mobility patterns. The basic notion here is that one can materially improve one's expected lifetime earnings by sacrificing some current earnings and engaging in some form of skill-development experience (e.g., an apprenticeship kind of atmosphere). If this model is in fact representative of labor markets, then the appropriate inference is that manpower training programs are well-founded.

The very general support for training programs provided by our study does not, of course, indicate what kinds of training or training mechanisms are appropriate for any particular population group. Ideally, we would like to identify the industries in which mobility rates are highest, and begin to explain how such high rates of mobility come about. Such an effort would begin to provide some guidelines for the orientation of training efforts.

We should also note that the high rates of relative earnings mobility we have observed imply that short-run evaluations of manpower programs must be interpreted with caution. The basic objective of such programs is to induce long-term ("permanent") improvement in an individual's earnings capacity. In an environment where both short- and long-term mobility is pervasive, we cannot be assured that observed short-run changes are representative of longer-term patterns.

V. Other Work

In addition to the two principal studies undertaken by our research project, some effort was expended exploring and developing other issues. Among these, the subject of manpower training programs received the most attention, particularly in the early stages of project activity. The focus of this effort was on the impact of manpower training, as perceived in a longitudinal context. As suggested by our analysis of relative earnings mobility, short-run changes in the earnings of manpower-program graduates may not be fully representative of long-run impact. Hence, the manpower training study was to measure longer-term impact, while also providing some indication of the kinds of training (OJT vs. institutional) and the kinds of initial post-training placement (industry and firm size) that appeared to maximize such impact. Data for this effort was obtained from the Manpower Administration, and consists of information on approximately 5,000 MDTA terminees who were enrolled in the program during the years 1963 to 1968. This data set was merged with the LEED file, thereby providing a fifteen-year record of earnings (including both pre- and post-program years). Although analysis of these records was begun, the manpower training study was terminated when it became apparent that the budget constraints of the project required exclusive attention to the higher priorities of the project, as discussed with ORD personnel.

Besides the manpower training study, most additional research effort was expended on further exploration of the project's two central studies, i.e., pensions and relative earnings mobility. With respect to pensions, considerable manpower has been devoted to examining the

potential for an expansion of the data set to include more firms and to identify the impact on work attachment of firm-specific pension plan changes (in a longitudinal context). With respect to relative earnings mobility, some effort has been devoted to preliminary explorations of the causal relation between firm of industry attachment and earnings mobility.

Revised
September 1975

Relative Earnings Mobility in the United States

Bradley R. Schiller*

Accumulated evidence suggests that the shape of the income and earnings distributions in the United States is fairly fixed, perhaps even immune to major changes in economic conditions and public policy [Budd (8); Henle (16); Schultz (36); Soltow (38); Thurow and Lucas (41)]. But we still know very little about how mobile individuals are within that rigid size distribution despite the abundance of hypotheses that have been offered to "explain" such (im)mobility. On the one hand, individuals may be highly mobile across discrete points of the aggregate distribution, suggesting a conventional musical chairs game (to the tune of the human capital school fight song) in which the position of the chairs themselves is the only thing that never changes. On the other hand, the rigid shape of the aggregate distribution is equally compatible with a total lack of personal mobility -- a game, as it were, that individuals play by remaining in their chairs until the music (played by dual labor market theorists and other structuralists) is over.

These extremes of relative income movement have profoundly different implications for our views of income distribution and economic opportunity, as a member of model builders have stressed. The conventional (neoclassical) musical chairs situation implies a high degree of equality in opportunities,

---

*University of Maryland. Financial support for this research was provided by the Manpower Administration, U.S. Department of Labor and the University of Maryland's Computer Science Center. William T. Sutton provided valuable computational assistance.

and perhaps in life-time economic well-being as well [Lillard (21)]. The other game implies a lack of opportunity -- a highly stratified economic structure -- and inequalities in lifetime well-being which are far greater than observed inequalities of current income. With respect to economic behavior, the musical chairs view enhances the potential importance of individual decision-making, especially vis-a-vis career patterns and human capital investment. High mobility (variability) around a more stable long-run earnings path also enhances the view that consumption decisions are guided by permanent, rather than current, income perspectives. On the other hand, if everyone's relative position is fixed, then both the significance of individual decision-making and the distinction between permanent and current income are diminished.

Given the importance of individual earnings paths (functions) for assessing the appropriateness of alternative theories and policies, it is somewhat surprising that so much empirical attention has been devoted to the shape of the size distribution of income and so little to the question of what is happening [illegible] in that distribution.[1] What few clues we have on this subject are largely confined to retrospective studies of occupational status change [Blau & Duncan (5); Parnes (27, vol. 1)] or preliminary impressions from limited longitudinal studies [Parnes (27, vol. 2-3); Morgan (26); Kohen (20); Taubman (39)]. The purpose of this

---

[1] Even on a purely theoretical level, it is difficult to comprehend how so many theories of aggregate distribution can have been formulated [e.g., Brofenbrenner (7); Lydall (22); Pen (28)] without more consideration of how mobile individuals are in terms of relative income and what factors might account for such mobility. Perhaps Pareto was leading us down the wrong road when he directed us towards universal mathematical characterizations of the income distribution, the kind of inquiries which have encouraged neglect of individual mobility and welfare.

paper is to help fill this empirical void by examining individual earnings patterns in a longitudinal framework (1957-71), using Social Security earnings records as a data base.

The paper begins with a brief introduction to the data source, then a discussion of the statistical framework (transition matrices) used for summarizing our empirical observations. The third section provides a review and restatement of hypotheses offered to explain (im)mobility of individual relative earnings. The fourth section tests these hypotheses against the data, first on the basis of all workers in the sample, then on the basis of race and individual age cohorts. Cyclical phenomena are explored in the fifth section, by using alternative observation years. The paper concludes with a general summary and conclusions.

The principal finding of this inquiry is that relative earnings mobility is extensive among employed males, both across and within age cohorts, thus lending considerable support to those labor market models that predict high rates of mobility. Of the models tested, the on-the-job training variant of human capital models stands out in this regard, while serious doubts emerge about those models that postulate varying degrees of segmentation or immobility. But we also find that black male workers do not share fully in the general pattern of mobility; these racial differences in earnings mobilityprovide evidence of at least some selective segmentation (discrimination). Additional findings are highlighted in Section IV.

I. The Data

In order to determine the extent of mobility in relative earnings over time we need to know the actual distribution of earnings in every year, as well as each worker's position therein. The only data source capable of satisfying both requirements is the longitudinal earnings records maintained by the Social Security Administration. Accordingly, we employ the Longitudinal Employer-Employee Data (LEED) file of SSA records, which contains quarterly observations on individual earnings histories for one percent of all covered earners. The unique and overwhelming advantages of the LEED file are (1) sheer volume, (2) longitudinal continuity, (3) nearly universal coverage (over 90 percent of all wage and salary workers are now covered), (4) detail on firm and industry attachment, and (5) reliability. On the last point it is important to note that approximately twenty percent of all workers have earnings in excess of SSA tax ceilings, and that SSA extrapolates from quarterly earnings to derive annual earnings estimates for this group. Although these estimates turn out to be very crude approximations for the highest-income groups, they are adequate for assigning individuals to broad subdivisions of the aggregate distribution. What make the SSA data particularly appealing from a theoretical point of view is that they focus on labor earnings alone, and thus on the outcomes of labor market processes.[2]

Although the LEED file is obviously well-suited for an inquiry into earnings mobility, it is not perfect. Of particular concern is the absence

---

[2] See Thurow (40) for a discussion of the differences in labor and nonlabor income determination. We should also note that annual earnings are the largest component of total income as well as the largest source of variability in family incomes over time [Morgan (26); Smith (37)].

of data on education and occupation, which limits our ability to explain observed mobility patterns. In addition, SSA records cannot distinguish between (A) a move from covered employment to noncovered employment (principally federal and various state and local jobs) and (B) a move to unemployment or nonparticipation status. Hence, the data is best-suited for a study of mobility among persons continuously in covered employment, and we shall concentrate on this subpopulation.[3]

The present inquiry focuses on a sample of 74,227 men from the LEED file. To be included in the sample, male workers had to satisfy the following conditions:

(i) between the ages of 16 and 49 in 1957, the first year of our observation period;

(ii) at least $1,000 of earnings in 1957;

(iii) earnings in 1971, the final year of our observation period.

Conditions (i) and (iii) are imposed to assure a sufficiently extended longitudinal framework, without including workers who begin working at unusually early ages or continue working past typical retirement ages. Even when we limit ourselves to observations of those workers employed in both 1957 and 1971, however, our mobility measures may be overly influenced by people, particularly youth, who had little attachment in 1957 but later moved into the labor force on a full-time basis. In fact, two-thirds of the youngest cohort (aged 16-19) earned less than $1,000 in 1957, most

---

[3] Not all "covered" earnings are reported, of course; many employers (most notably employers of domestic help) do not report wages or pay the required taxes. But this problem is not likely to affect our results significantly, as we restrict our observations to male workers with substantial work experience.

of it presumably from summer or part-time jobs. Although the later mobility of these individuals is of interest, our primary concern is to gauge the extent of their mobility from the point of substantial labor market participation. Accordingly, condition (ii) restricts our observations to the group of workers who earned at least $1,000 in 1957 (one thousand hours at the minimum wage), a group I refer to as "attached workers." The objective of the inquiry is to determine how the relative earnings of these workers changed during the subsequent fourteen years.

II. The Statistical Framework

Our measure of relative earnings mobility is in terms of discrete distances across the earnings distribution. As noted above, the earnings data compiled by the Social Security Administration allow us to reconstruct an earnings distribution for any given year. This has been done for each year of the observation period, using the entire one-percent LEED file of male workers as a data base. Each year's distribution has then been subdivided into twenty proportional parts ("ventiles"). With this information we can assign each of our 74,227 sampled male workers to a point (ventile) in the earnings distribution of any given year, based on his actual earnings of that year, then determine whether or not he moves to another ventile in subsequent years.

The advantage of focusing on changes in relative earnings rather than on changes in absolute earnings is twofold. First, it is consistent with the relative status perspective which we assume most people share; that is to say, we assume that most people evaluate their socioeconomic

status in relative terms, by deciding whether they are behind, ahead of, or just keeping up with the Joneses. Second, it automatically adjusts for changes in money wages (inflation) and for any shifts that might be occuring in the aggregate (size) distribution. What it does not tell us, of course, is whether or not the mean distance (measured in dollars) between points of the distribution are increasing or not, a measure of change in the size distribution of earnings and hence of equality in status.[4]

Although the focus on relative, rather than absolute earnings is desirable, it still poses a conceptual problem. A change in relative earnings over a fifteen year period may be due to either of two phenomena, namely: (1) a change in relative age, i.e., experience, or (2) work experience which is qualitatively different from that of other workers of similar age. That is to say, total mobility is a function of both inter- and intracohort mobility.

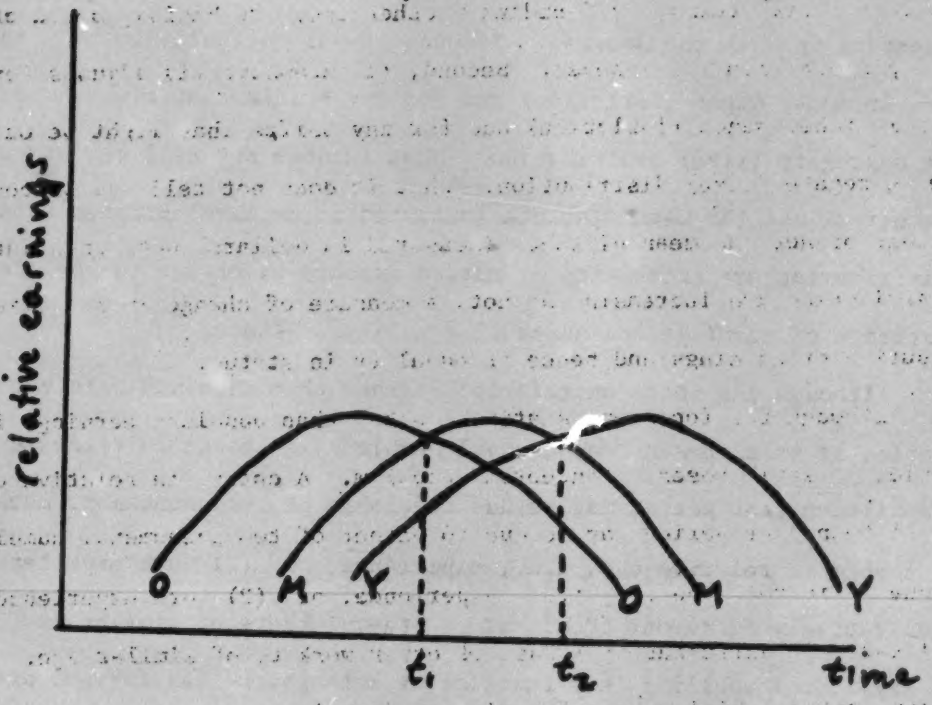
The distinction between the two kinds of mobility is illustrated in Figure 1. The three curves represent the age-earnings profiles specific to three cohorts, the 'younger' (Y), the 'older' (O), and the 'middle' (M) aged groups. Two phenomena are noteworthy here. First, because there is a distinct relationship between age (experience) and earnings,[5] our observations

---

[4]More specific consideration of these issues is contained in McCall (23) and Ruggles (32), both of whom use Social Security records as an empirical base.

[5]See Ruggles and Ruggles (32) or Vroman (in 13) for an empirical summary of actual age-earnings profiles. As Ruggles and Ruggles demonstrate, cross-sectional views of the age-earnings relation obscure the fact that individual cohorts continue to experience absolute earnings gains throughout their working lives; the cross-sectional profiles are attributable to higher earnings gains for younger cohorts. The same kind of profile appears in Figure 1 due to the fact that we have plotted relative rather than absolute earnings. A more limited sample of longitudinal profiles is analyzed by Taubman (39).

Figure 1. Age-Earnings Profiles



of relative position are sensitive to the place of each cohort in the age-experience spectrum, i.e., to the timing of our observations. Notice in particular how we might observe a high degree of rigidity at the top of the earnings distribution, together with a lot of mobility in the lower ventiles, if our observation points happened to coincide with t_1 and t_2. Second, note that the age earnings profiles reflect the average experience of an entire cohort, and may obscure a lot of intracohort mobility around that average.

We must decide, then, what kind of mobility is of greater interest. Do we tend to gauge (and enjoy) our status in relation to all other workers or to restrict our comparisons to only those of approximately the same age (and sex and race?)? If the latter kind of comparison is more common, then the age-earnings profile of each cohort, rather than the entire earnings distribution, is the appropriate basis for evaluating mobility. Intracohort observations also seem more appropriate from a theoretical viewpoint, particularly if we want to evaluate mobility in terms of a competing labor market models, as we shall discuss below.

To isolate intracohort movement, we have reconstructed the earnings distributions specific to each five-year age cohort and again partitioned each into ventiles. Thus, each worker is assigned not only a rank (VP) in the aggregate earnings distribution for all workers, but also a rank (CVP, or cohort ventile position) in the distribution for his age cohort; it is the latter measure which serves as the focus of our present inquiry. Hence,

we end up describing how much the earnings of any given worker change in relation to the earnings of other (attached) workers his own age.[6]

Table 1 indicates the earnings boundaries of each cohort ventile in 1957 and 1971, for selected cohorts. Thus, for example, a 32-year-old worker earning $5,000 in 1957 was in the thirteenth ventile of his cohort's earnings distribution. Suppose that fourteen years later he is earning $9,000. From the table we see that this implies a reduction in relative earnings, as $9,091 is the earnings ceiling for the tenth ventile among workers aged 45-49 in 1971.

What we seek to determine, then, is whether and to what extent people move from one cohort-specific ventile to another over the course of their working lives. The basic output of our inquiry is a series of transition matrices linking each individual's cohort ventile position in one year ($CVP_{i(t)}$) to his position in a subsequent year ($CVP_{i(t+n)}$); a move from $CVP_{(t)}$ to $CVP_{(t+n)}$ is our basic measure of relative earnings mobility.

The transition matrix contained in Table 2 provides an illustration of our basic output. In this case we have depicted the relative mobility of our entire sample of 74,227 males, expressed in percentages; in terms of our earlier notation, $CVP_{(t)}$ refers to 1957 and $CVP_{(t+n)}$ to 1971. Thus, Table 2 indicates the extent of relative earnings movement over a 15-year period experienced by individuals, classified on the basis of their relative cohort position in 1957.

---

[6] It is worth noting that the intracohort mobility accounts for most of the mobility we observe; that is to say, intracohort mobility overwhelms intercohort mobility -- experience per se is not as important as the nature of that experience in determining relative earnings growth.

Table 1. Earnings Boundaries for Cohort-Specific Ventiles, 1957 & 1971, For Selected Cohorts

Ventile age:	1957 20-24	1957 30-34	1957 45-49	1971 20-24	1971 30-34	1971 45-49
1	$ 187.	$ 342.	$ 320.	$ 254.	$ 853.	$ 879.
2	395.	914.	857.	566.	2159.	2443.
3	616.	1539.	1471.	900.	3372.	3708.
4	843.	2105.	2031.	1228.	4448.	4888.
5	1071.	2622.	2522.	1568.	5397.	5829.
6	1326.	3072.	2961.	1930.	6192.	6629.
7	1594.	3496.	3379.	2343.	6905.	7286.
8	1859.	3811.	3732.	2792.	7442.	7831.
9	2119.	4091.	4009.	3252.	7944.	8442.
10	2387.	4370.	4313.	3726.	8500.	9091.
11	2636.	4653.	4634.	4216.	9066.	9758.
12	2891.	4932.	4956.	4714.	9631.	10436.
13	3147.	5219.	5281.	5216.	10219.	11145.
14	3412.	5521.	5646.	5734.	10841.	11912.
15	3683.	5850.	6070.	6283.	11527.	12835.
16	3951.	6252.	6579.	6897.	12310.	14068.
17	4270.	6744.	7248.	7510.	13429.	15628.
18	4683.	7452.	8234.	8325.	14955.	17801.
19	5889.	9501.	11267.	9898.	17664.	20000.
20	----	----	----	----	----	----
Average Earnings	$2502.	$4451.	$4833.	$4192.	$3865.	$10354.

Table 2 Rates of Intracohort Mobility, 1957-71

1971 Cohort Ventile

1957 Cohort Ventile

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
3	.104	.138	.087	.119	.088	.068	.063	.043	.036	.039	.030	.025	.028	.016	.017	.024	.015	.024	.011	.017	.026
4	.088	.096	.100	.111	.119	.083	.058	.035	.040	.035	.032	.028	.031	.024	.017	.018	.021	.023	.008	.013	.037
5	.062	.083	.068	.105	.106	.091	.080	.068	.053	.036	.038	.031	.029	.020	.025	.013	.023	.026	.016	.020	.050
6	.053	.057	.050	.078	.087	.091	.086	.072	.056	.048	.047	.048	.039	.034	.028	.029	.024	.027	.021	.027	.070
7	.041	.050	.046	.058	.072	.091	.086	.085	.069	.059	.056	.050	.046	.035	.034	.030	.027	.027	.017	.023	.063
8	.038	.054	.041	.051	.062	.066	.088	.092	.072	.065	.053	.048	.046	.038	.033	.042	.032	.031	.023	.025	.051
9	.037	.040	.032	.045	.056	.065	.078	.101	.066	.072	.061	.056	.058	.051	.044	.037	.029	.032	.021	.019	.051
10	.034	.038	.034	.034	.044	.046	.061	.073	.080	.078	.071	.074	.058	.052	.042	.052	.039	.040	.024	.024	.060
11	.029	.029	.028	.037	.038	.054	.054	.069	.073	.081	.092	.074	.078	.071	.050	.044	.040	.032	.018	.018	.050
12	.028	.030	.024	.028	.034	.037	.045	.061	.063	.072	.083	.081	.080	.076	.061	.056	.045	.041	.027	.028	.055
13	.025	.021	.022	.029	.033	.037	.041	.050	.058	.068	.079	.080	.082	.074	.083	.055	.065	.047	.024	.026	.054
14	.027	.031	.026	.028	.029	.040	.041	.043	.052	.037	.061	.071	.083	.062	.081	.077	.055	.052	.033	.033	.062
15	.026	.030	.021	.026	.025	.030	.032	.042	.044	.052	.060	.069	.064	.077	.084	.089	.070	.064	.041	.036	.065
16	.021	.027	.026	.023	.021	.028	.028	.037	.039	.045	.056	.065	.073	.076	.088	.089	.093	.081	.040	.050	.062
17	.022	.022	.021	.018	.018	.020	.026	.038	.035	.046	.044	.053	.071	.068	.087	.092	.095	.097	.062	.064	.061
18	.021	.025	.015	.020	.022	.024	.026	.028	.032	.031	.040	.046	.061	.065	.067	.087	.101	.129	.084	.079	.059
19	.016	.022	.020	.015	.016	.019	.015	.025	.021	.025	.030	.042	.044	.049	.050	.071	.087	.144	.118	.163	.074
20	.018	.017	.017	.016	.018	.013	.016	.015	.022	.021	.026	.021	.028	.037	.038	.050	.056	.085	.110	.368	.049
	.035	.040	.035	.042	.046	.048	.050	.055	.051	.052	.053	.055	.058	.055	.054	.056	.054	.060	.041	.058	1.000

N= 74,227

There are no observations in the first two rows of Table 2 because we excluded workers who earned less than $1,000 in 1957, enough to exceed the first two ventile ceilings in all cohorts. Thus, our observations begin in the third row, generally a group of very low paid workers. Reading across that row tells us that 24.2 percent of these workers had actually fallen still lower down the earnings distribution by 1971, while 9.7 percent had just maintained their relative status. The remaining 66.1 percent, of course, had improved their relative position by that time, although few people managed to make the Horatio Algier climb from the low end of the distribution to its highest range ($P_{3,20}$). In the same vein, few of those who began at the top of the income distribution in 1957 fell to its lowest points by 1971: there were as few riches-to-rags stories as rags-to-riches ones. In between these extremes, however, there was extensive mobility, as witnessed by the low concentration in the diagonal elements $P_{j,j}$.

Table 3 provides summary measures of the mobility detailed in Table 2. Perhaps the single most meaningful index of mobility is the correlation coefficient, r. Here we note that r has a value of .15, suggesting that there is virtually no linear relationship between $CVP_{i(1957)}$ and $CVP_{i(1971)}$.

The other measures of mobility depicted in Table 3 attempt to convey the extent of movement experienced by our highly mobile sample. In this regard, the mean absolute change (average absolute deviation) is of particular interest, and is observed to be 4.22 ventiles, or approximately 17 percentiles across the cohort earnings distribution. The extent of mobility experienced by the individuals from each 1957 ventile is shown as well; the figures

Table 3. Summary Measures of Intracohort Mobility, 1957-1971

1957 Cohort Ventile	Mean Absolute Change	Percent Immobile	Mean Algebraic Change
1	---	---	---
2	---	---	---
3	4.26	35%	3.57
4	4.01	33	2.90
5	4.04	30	2.56
6	4.31	26	2.54
7	4.08	26	1.91
8	4.13	25	1.33
9	3.98	24	.64
10	4.05	23	.31
11	3.82	24	- .54
12	3.92	24	- .87
13	3.93	24	-1.48
14	4.27	25	-2.32
15	4.34	25	-2.82
16	4.45	27	-3.30
17	4.56	28	-3.73
18	4.75	31	-4.27
19	4.51	42	-4.19
20	4.12	48	-4.12
Total	4.22	29%	- .93
	(3.82)		(5.61)

Correlation coefficient = .150

N = 74.227

suggest that the extent of mobility experienced does not vary substantially across 1957 ventiles.[7]

Mean absolute changes in relative position may, of course, disguise a lot of immobility if the means are overly influenced by the experiences of a small number of highly mobile people. Accordingly, a second measure of mobility is depicted in Table 3, namely, the percentage of people who move less than two ventiles. A move from one ventile to another may encompass a distance of anywhere from 0 to 10 percentiles and may thus obscure a lot of immobility. Hence, we designate $\Delta CVP < 2$ as "little or no mobility." By this standard, 29 percent of the entire sample was immobile, although there are marked differences across 1957 ventiles. Notice in particular the significantly higher rates of immobility in the highest and lowest 1957 ventiles: the relative status of people at the top or bottom of the earnings distribution is significantly more stable than the status of those in the broad middle ranges of the distribution.

Finally, we depict the mean algebraic movement of the sample and each of the 1957 cohort ventiles. The overall algebraic decline in status results from the fact that we imposed a floor under 1957 ventile positions but not under 1971 positions; otherwise the mean algebraic move for the entire sample would be zero and of no interest. In examining the algebraic movement of the separate 1957 ventiles, a "regression towards the mean" is clearly discernible, implying more equality of lifetime earnings than is evident in the figures for any particular year.

---

[7] A difference of approximately 0.2 between ventile means is statistically significant at the .05 level, however.

III. Theoretical Expectations

As interesting as Tables 2 and 3 are, they do not emit any obvious standards of mobility. Is the fact that 66.1 percent of those in a low 1957 ventile moved up the distribution over the ensuing fourteen years significant? Should we be concerned that 29 percent of the sample was immobile? Is an average move of 4.22 ventiles important? In other words, what kind of mobility do we consider "a lot" or "a little" and can we develop some standards for evaluating the mobility we observe?

To some extent, standards for assessing relative earnings mobility can be fashioned out of competing models of labor market behavior. At one extreme, for example, would be models of rigid segmentation, particularly those that emphasize discrimination predicated on class origins rather than, say, race or sex [Bowles (6); Schiller (33,35)]. If everyone's opportunities were narrowly circumscribed by parental socioeconomic status -- e.g., via neighborhood schools and occupational "connections" -- then we would observe little or no relative status change either across or within generations. In terms of our statistical framework, what we would observe would be a transition matrix with all major diagonal entries equal to one and all nondiagonal entries equal to zero.[8] From this perspective "mobility" could be gauged in

---

[8] It is interesting to note that there are other models of labor market behavior that also yield diagonal matrices. In a world where opportunities were neither constrained nor enhanced by social-class factors, natural ability would tend to dominate relative status opportunity, especially if one downgrades the random kind of error often referred to as luck or chance. From this perspective, relative status depends on genetic, rather than social-class origins [Herrnstein (17), but also Conlisk (9)]. Consequently, observing a diagonal matrix would not settle the "nature vs. nurture" controversy, but only fan the existing flames.

terms of the sum of deviations from the diagonal matrix, i.e., in terms of $\Sigma \mid P_{j,K,j \neq K} \mid$, perhaps weighted to account for the distance of movement.[9]

Not all models of segmentation are so rigid, of course. Models of discrimination based on race or sex (rather than class) postulate nondiagonal entries, but expect them to be differentiated by the presence of 'preferred' or 'nonpreferred' workers [Becker (2), Furstenberg (13), Bergmann (4)]. Presumably, what they envision for our sample is a matrix that confines all black workers to the upper left corner of the matrix, i.e., to $P_{j,k,}$ where $j,k < b$, the boundary between 'black jobs' and 'white jobs.'

The more general model of dual labor markets yields a matrix in which mobility is similarly bounded, but not exclusively by race or sex. The essential feature of such models is the duality barrier which separates 'primary' (or 'core') from 'secondary' (or 'peripheral') markets: it is asserted that few workers hurtle that barrier [see Doeringer and Piore (11), Gordon (14), Wachter (42)]. Thus, dual labor market theorists should anticipate empty cells in the upper right and lower left corners of our matrix, i.e., in cells where $j>d$, $k<d$ or vice versa.

Dual labor market theorists are not so explicit, however, about their predictions for the remaining cells. One might suggest, though, that ventile assignments <u>within</u> the secondary market are essentially random, since it is postulated that age and experience do not pay off in that market. That is to say, there are no 'better' or 'worse' career paths in the

---

[9] Alternatively, we could simply compute a X^2 statistic to determine the likelihood of observing our sample matrix, given the assumption of rigid segmentation in the underlying population; however, such calculations are meaningless with samples of the size we are observing.

secondary market that will systematically alter relative earnings positions. But what about earnings mobility within the primary market? It has suggested that relative wages in the primary sector are rigidly fixed by custom [Piore (29,30)], implying very little latitude for changes in relative earnings position, especially when adjusted for years of work experience (or age cohort). This suggests a matrix of CVP transitions will produce $P_{j,k=j>d} = 1$ and zeros in the remaining cells of the lower-right corner. Thus, the theoretical expectations generated by dual labor market models may be summarized as:

$$P_{j,k} = \frac{1}{d} \text{ for } j,k<d,$$

$$P_{j,k} = 1 \text{ for } j=k>d, \text{ and}$$

$$P_{j,k} = 0 \text{ for } j>d,\ k<j \text{ and } j<k,\ k>d$$

To test such a model we would have to assign a ventile position to d, of course. For purposes of illustration, I will later locate d at VP = 5, suggesting that workers in the third and fourth (1957) ventiles were in the secondary market.[10]

The kinds of mobility expectations generated by models of labor market segmentation can be distinguished from those generated by human capital models. As suggested earlier, the basic message of human capital theories

---

[10] This means that their earnings were between $1,000 and $2,223 (depending on their age cohort) in 1957, at which time the mean earnings was $4,059 for all male workers (including those with only peripheral labor force attachment, i.e., those with less than $1,000 earnings in 1957).

is that individuals possess the power to alter their lifetime stream of earnings by making alternative sacrifices and investment decisions [Becker (3); Lillard (21); Mincer (24,25)]. If this is the case, then we would anticipate that individuals experience distinctly different earnings streams over time. In particular, if human capital theorists are correct in assuming that investments in one's later earnings potential entail the sacrifice of present earnings, then we might expect to observe considerable mobility in relative earnings (ranks) as individuals experience the burdens and pay-offs of their varying investment decisions: those individuals who invest heavily should ultimately rise to the top of the earnings distribution, while small investors should fall to the lower percentiles.

Our expectations vis-a-vis relative earnings mobility are sensitive, of course, to the kinds of investment we think important. If all human capital investment takes place prior to labor market entry -- as too many human capital theorists take for granted when they use years of schooling as their only measure of such investment -- then it is conceivable that we would observe few changes in relative earnings positions once everyone had entered the labor market. In effect, everyone would be assigned a permanent position (rank) in the earnings distribution on the basis of the human capital they brought to the labor market. As Taubman (39) has argued, even if that capital is not immediately observable at the time of entry, employers will soon differentiate among workers on the basis of performance. Under these conditions, workers will move quickly into permanent relative positions (all $P_{j,j} = 1$), although the dollar distance between those positions will grow over time; only the matrix comprised of the youngest post-school cohort

(age 20-24) should evidence substantial departures from this expectation, in recognition of the time it takes for labor market entrants to locate in their permanent human capital positions.

A very different set of expectations is generated by those human capital models that emphasize on-the-job training. In particular, we should expect to observe more mobility between discrete points of the earnings distribution -- what Mincer (24) calls "crossovers" (and we observe as $P_{j,k} \neq 0$) -- where human capital investments are assumed to take place in the labor market itself; that is, where experience (on the job training) is an important determinant of the slope of individual earnings functions. In view of the increasing recognition given to on the job training and investment [Haley (15); Johnson & Hebein (19); Mincer (25); Rosen (31)], it seems reasonable to anticipate considerable crossing of relative earnings positions, at least from this particular view of labor market dynamics.

The difficulty with the OJT variant of human capital models is the empirical need to specify what is meant by a 'considerable' amount of crossovers. One could argue that the opportunities for on the job training are so numerous that all individuals have the chance to move to any point in the distribution. From this perspective, we might anticipate a matrix with all $P_{j,k} = .05$, with the relative position of each individual determined by his tastes, his discount rate, and the duration of the relevant investment and pay-off periods.[11]

---

[11] Note that this expectation is identical to that generated by models that attribute relative status to a large and unquantified stochastic factor called luck or chance [Friedman (12), Jencks (18)]. We shall return to this point when we test the models in Section IV.

Although the expectation of all $P_{j,k} = .05$ is not inconsistent with the OJT model, it does not fully reflect the richness of the model. In particular, Mincer and others argue that the amount of OJT investment is reflected in the difference between actual and potential (opportunity) earnings during the investment period, with the pay-off expressed as the excess of later earnings over what they would have been in the absence of such investment. In terms of our statistical framework, this implies that individuals of given ability who begin in lower ventiles should experience more upward mobility than others with equal ability but higher initial earnings positions. To test this hypothesis, we would have to identify workers of "equal ability" in our data set, something we are unable to do. Within the confines of the present data set we could test this hypothesis only if we were willing to assume that all workers entered the labor market with identical potential (ability) and also that our fifteen-year observation period captured the bulk of the investment and pay-offs period, in which case one could postulate a transition matrix will all minor diagonal elements equal to one, i.e., $P_{j,20-j} = 1$. But neither assumption is very palatable. Accordingly, we are compelled to evaluate the OJT model on the basis of departures from the model described above.

A perspective which combines some of the features of both labor market segmentation and human capital theory has been dubbed the job competition model [Thurow (40]. According to this view, marginal productivities are inherent in jobs, not people. Thus workers compete for access to a fixed distribution of marginal productivities (jobs), either on the basis of their trainability or employer prejudices; relative earnings positions are determined

by the outcomes of the job competition. An interesting (and testable) implication of this particular view is that movements between discrete points of the earnings distribution will tend to be accompanied by external job changes.

We may assert, then, that competing models of labor market behavior do imply different relative earnings patterns over time. They are not so well-specified, of course, that one can expect to identify a given amount of mobility as uniquely verifying a particular model; ultimately, we can distinguish between them only on the basis of subjective judgements of what constitutes a 'little' or a 'lot' of relative earnings mobility. In so doing, however, we may provide some important perspectives on labor market behavior.

IV. Findings

The labor market models reviewed in the preceeding section will be tested by comparing their predicted transition matrices to the ones we observe. The matrix and summary measures depicted in Tables 2 and 3 serve as the foundation for such tests, although submatrices are generated for blacks and for different age cohorts as the testing proceeds. With the exception of the job competition model, each of the modsls is tested separately, with a general summary provided in Section VI.[12]

[12]The job competition model will be tested in a separate paper on firm attachment patterns and payoffs, using a different subset of the data base.

A. Class Discrimination

As noted earlier, models of rigid segmentation based on class or parental socioeconomic status imply no movement off of the major diagonal. Such models are clearly incompatible with observed patterns. First of all, we may note that only 10.6 percent of the workers in our sample satisfy this expectation; the other 89.4 percent represent deviations. Even on the basis of our more liberal measure of immobility, i.e., $\Delta CVP<2$, we find (Table 3) that only 29 percent of the sample lives up to the expectations generated by this model. And finally, we may recall that the correlation coefficient between CVP_{1957} and CVP_{1971} amounts to only .15, suggesting pervasive mobility.

What little support the class discrimination model does find in our data resides at the extremes of the earnings distribution: over 33 percent of the lowest-paid (attached) workers remain at the bottom of the distribution, while well over 40 percent of those in the highest reaches of the distribution remain in their position over the fifteen years of our observation period.

B. Racial Discrimination

The failure of the most extreme segmentation model to account for observed mobility patterns does not deny the possibility of discrimination against particular subpopulations of any class, of course. Accordingly, we may consider an explicit test of the racial discrimination hypothesis next. To do so, we have constructed a transition matrix for the 6,109 blacks in the sample, with their relative status determined by their earnings in comparison to all workers of the same age cohort.[13]

---

[13] This and subsequent matrices are available on request from the author.

The simplest version of the discrimination model, namely the notion that blacks are confined to (or "crowded into") the lower end of the earnings distribution is not supported by our observations. To test the model, we have to identify the boundary, b, which separates blacks and whites, of course. Without stipulating b a priori, we can instead look for such a demarcation in the data itself. What we find is that the 'boundary,' if it exists, is high up into the distribution. Only 17 percent of the blacks in our sample are confined to the first five ventiles, 50 percent to the first nine, and we must go as far as the twelfth ventile to capture 70 percent of the blacks. Accordingly, it is unrealistic to postulate that blacks are restricted to a very narrow range of (relative) earnings at the bottom of the distribution.

This is not to deny any evidence of discrimination, of course, but only to reject the crudest models of it. There are alternative formulations. One might hypothesize, for example, that individual blacks enter the labor market with different bundles of skills and thus start out in a variety of ventile positions. Having begun their careers, however, they confront restricted opportunities for further mobility. This hypothesis is compatible with our observation that there is no meaningful boundary between blacks and whites on the earnings scale; what it suggests is that blacks will experience less mobility than whites once their starting position is determined.

At first blush, it appears that this variant of the racial discrimination model is also incompatible with actual experience. In particular, a correlation coefficient for black workers of .29 while almost double the

value of the total sample coefficient, still suggests pervasive mobility. But differential patterns of mobility become apparent as the data is examined more closely. Note in Table 4, for example, that blacks experience a mean absolute move of 3.73 ventiles, compared to average white mobility of 4.22 ventiles, a difference which is both statistically significant (at the .0005 level) and important. Thus, although both blacks and whites are "mobile," there are clear differences in the distance of mobility.

Another index of differential mobility is provided by our measure of the percent immobile ($\Delta CVP<2$). Overall blacks are not disproportionately immobile (30% vs. 29%). However, the differences in rates of immobility across ventiles is striking, as Table 4 attests. Notice in particular the much higher rates of black immobility in the lower ventiles and the dramatically lower rates of black immobility at the top of the distribution. What this means is that black workers have an easier time staying at the bottom of the distribution but a precariously difficult time clinging to the higher earnings positions.[14]

Our third measure of racial discrimination is the mean algebraic change in relative earnings positions experienced by whites and blacks. Our concern here is to determine whether or not blacks and whites who begin in the same 1957 position move equal distances therefrom. Our observations on immobility rates already suggest a negative answer, of course. But the algebraic deviations provide the clearest picture of just how difficult it

---

[14]This transitory characteristic of high earnings positions for blacks implies that high earnings might appropriately be regarded as a "windfall" and spent accordingly.

Table 4. Comparative Black Mobility, 1957-71

1957 Cohort Ventile	Percent Immobile		Mean Algebraic Change	
	White	Black	White	Black
1	---	---	---	---
2	---	---	---	---
3	35%	47%	3.57	1.93
4	33	44	2.90	1.39
5	30	39	2.56	.88
6	26	37	2.54	.58
7	26	29	1.91	.42
8	25	26	1.33	- .36
9	24	20	.64	- .67
10	23	23	.31	- .55
11	24	22	- .54	-1.76
12	24	26	- .87	-2.34
13	24	23	-1.48	-2.20
14	25	20	-2.32	-4.44
15	25	17	-2.82	-5.15
16	27	15	-3.30	-6.10
17	28	15	-3.73	-6.83
18	31	16	-4.27	-7.68
19	42	10	-4.19	-7.97
20	48	07	-4.12	-7.21
Average	29%	30%	- .93	- .77

is for blacks to hold onto high relative earnings positions. Notice in Table 4, for example, that blacks from the highest 1957 ventiles fell, on average, over three ventiles further than similarly positioned whites. On the other hand, blacks who started out in the lower ventiles in 1957 failed to achieve the higher upward mobility of whites from those same ranks.[15]

As a concluding observation, we may note that, overall, black workers failed to increase their relative status over the period 1957 to 1971. Their relative gain of .15 ventiles is not only inconsequential from a socio-economic perspective, but even fails to achieve statistical significance at the .01 level, something quite unusual for this sample. What this observation suggests is that the civil rights and equal opportunity initiatives of the 1960s failed to benefit black workers who were already assimilated into the labor market; at best, it appears that such activity benefited only black entrants into the labor force, workers who would not be included in our sample of attached workers.[16]

---

[15] All of the ventile-specific differences between the algebraic mobility of blacks and whites, as reported in Table 4, are statistically significant at the .001 level.

[16] Victor Fuchs has suggested that this conclusion is not fully warranted, as the relative status of blacks might actually have fallen in the absence of the Civil Rights Movement; but this is a very limited concept of success (and itself unproven).

C. Dual Labor Markets

As we noted in Section III, the dual labor market model cannot be meaningfully tested unless one is willing to identify the location of the boundary, d, between primary and secondary markets and formulate explicit hypotheses about relative earnings behavior in each market. We have chosen to locate d at the fifth ventile, and compared the transition matrix of Table 2 to the dual labor market model on this basis. As it turns out, the substance of our findings is not sensitive to this choice. What we find is that the dual labor market model does little better than the more rigid class discrimination model in accounting for observed mobility. Overall, only 14.8 percent of the sample fulfills the expectations of either remaining in the secondary market or in a fixed relative position within the primary market. If we use our broader measure of immobility ($\Delta CVP<2$) in the primary market, the predictive capability of the model increases to 30.5 percent of the sample, still quite modest, especially in view of the fact that a perfectly random distribution of people across ventiles would 'explain' half of that. Hence, the expectations of the dual labor market model are not fulfilled.

It could be argued legitimately, of course, that our sample of attached workers does not really represent the population envisioned by dual market theorists, particularly with respect to the secondary market. It is often suggested, for example, that women, blacks and teenagers comprise a substantial proportion of the secondary labor market. Hence, we cannot really disprove the duality hypothesis by observing high rates of mobility among a general sample of attached male workers.

But this objection is not wholly convincing. First of all, our data at least suggest that vast numbers of males move out of low-paying jobs into better ones, thus refuting the notion of a self-contained trap. Second, we have already demonstrated that the simple duality model does not apply to black males. As for teenagers, the model can only suggest that the kinds of jobs available to young, inexperienced labor market entrants are limited, not that people who begin work at young ages never climb the relative status ladder.[17]

D. Human Capital Models

In testing human capital models we must maintain the distinction between those that focus exclusively on schooling and those that emphasize on-the-job training. As we observed earlier, the basic schooling models generate (im)mobility expectations similar to those of class discrimination models; thus, they fail to account for the mobility patterns we have documented. Even if we respond to Taubman's suggestion that it may take a few years for workers to find their appropriate human capital slots, the model's predications are still incompatible with actual experience. This can be seen in Table 5, which depicts the mobility experiences unique to each cohort. According to Taubman's argument, very little mobility should be experienced by workers over the age of twenty-five. But examination of Table 5 clearly indicates that mobility is a pervasive phenomenon for all age cohorts, despite the fact that rates of mobility (as measured by

[17]The workers in our sample who were aged 16-19 in 1957 experienced extremely high upward mobility over the ensuing fourteen years, rising an average of 9.1 ventiles in the aggregate (not cohort-specific) earnings distribution.

Table 5. Intracohort Mobility Measures, by Cohort and Race

1957 Cohort	Mean Algebraic Change		Mean Absolute Change		Percent Immobile		N	
	total	black	total	black	total	black		
16-19	-5.60	-8.79	6.49	9.09	.17	.06	3547	total
	(5.72)	(5.10)	(4.68)	(4.55)			198	blacks
20-24	- .56	-2.03	5.23	4.43	.20	.23	11839	
	(6.50)	(5.16)	(3.89)	(3.33)			1064	
25-29	- .70	- .74	4.46	3.82	.24	.26	13401	
	(5.81)	(4.87)	(3.79)	(3.11)			1152	
30-34	- .48	- .00	3.79	3.41	.31	.33	13509	
	(5.18)	(4.60)	(3.56)	(3.09)			1130	
35-39	- .74	- .16	3.68	3.08	.33	.35	12672	
	(5.06)	(4.13)	(3.55)	(2.76)			990	
40-44	- .85	.07	3.62	3.08	.35	.37	11028	
	(5.04)	(4.22)	(3.60)	(2.88)			922	
45-49	-1.00	.13	3.72	3.28	.35	.35	8231	
	(5.18)	(4.46)	(3.74)	(3.02)			670	

Note: Standard deviations in parentheses

percent immobile or mean absolute change) tend to decline with age. Indeed, the table demonstrates that extensive intracohort mobility continues right up to the point of retirement, with only one-third of our oldest cohort remaining immobile between the age of 45-49 (in 1957) and 59-63 (in 1971).

Those human capital models that emphasize on-the-job training investments fare much better in predicting our observed patterns of mobility. When we use the prediction of all $P_{j,k} = .05$, we find that the model correctly predicts over half (54.8 percent) of our observations. If we restrict ourselves to the broad middle range of the distribution, cutting off the highest and lowest two ventiles, the 'goodness of fit' rises to 60.5 percent. On either basis, it appears that the OJT model of human capital development derives considerable support from the data.

V. Cyclical Factors

It is possible that the high rates of mobility we have observed are sensitive to our choice of base and terminal years. On the one hand, we might anticipate that the extent of mobility will be affected by the duration of our observation period. On the other hand, we might expect that the particular base or terminal year chosen, regardless of the duration of the observation period, will influence our mobility measures. This second concern could be especially relevant to our sample, as the economy experienced a modest recession near the end of our observation period. Accordingly, we need to consider the possibility that cyclical factors have distorted our perceptions.

Those who postulate rigid segmentation in relative earnings distributions have no reason to anticipate that the extent of mobility will

increase with the duration of the observation period. But the one model that does a reasonably good job of prediction on our basic sample, namely the on-the-job training variant of human capital models, does imply such a relationship. And in fact, we find that our mobility measures are sensitive to the number of years that elapse between initial and terminal observations. If we restrict ourselves to the first ten years of the observation period, i.e., to 1957-1967, we find that r increases from .150 to .187, that the mean absolute move decreases from 4.22 to 3.54 ventiles, and the proportion of immobile workers increases from 29 to 34 percent. Moreover, the decrease in mobility is experienced by all ventiles and age cohorts.

The increase in mobility that results from adding four years to the 1957-1967 period may be due to the cyclical factors mentioned above, however. To test this hypothesis we can compare mobility rates for the periods 1957-1967 and 1962-1971.[19] If the latter period evidenced significantly more mobility than the former, then the possibility of cyclical distortions would have to be taken seriously. But that is not the case. The correlation coefficient for the 1962-1971 period is .192 (vs. .187), the mean absolute move is 3.67 (vs. 3.54) and the proportion immobile is 35% (vs. 34%). Accordingly, there is no evidence that our measures of mobility are seriously inflated by cyclical factors unique to the terminal year chosen.

---

[19] The use of 1962 rather than 1961 is dictated by our early formating of the basic data file into five-year observation periods; this does not influence our conclusions, here, however, as we shall note.

VI. Summary and Conclusions

The longitudinal earnings data reviewed in this paper unambiguously demonstrates that individuals are highly mobile across relative positions in the earnings distribution. Such mobility does not result primarily from the simple phenomenon of aging (gaining years of experience), but instead is manifest within narrowly defined age cohorts. Moreover, high rates of mobility are common to all age cohorts, suggesting that relative earnings mobility is a phenomenon that continues throughout one's working life.

Naturally, models of labor market behavior that imply high rates of individual mobility will find the greatest support in our observations. Of the models reviewed, the on-the-job training (OJT) variant of human capital models stands out in this regard, explaining more than half of our observations. However, because other models, particularly ones that distribute relative positions randomly (by "luck" or "chance") are equally good at "explaining" observed patterns, we cannot conclude that the OJT model is uniquely verified. What we can argue, though, is that the OJT model is far superior in predicting actual earnings experiences than either the dual labor market model and its variations or even the human capital model variant that stresses schooling as the prime form of investment. The modest declines in mobility rates observed for older cohorts may be due to schooling effects or segmentation, of course, but could also result if OJT opportunities decline — or are more frequently rejected — as workers age.

Our evidence is not strong enough, however, to reject completely alternative explanations of labor market outcomes. Although, for example, it is clear that models of pervasive stratification (on whatever basis) are

not likely candidates for general descriptions of the labor market, they may still play important roles. The lower mobility of black workers, for example, is obviously consistent with such models, as is the tendency toward lower mobility in the highest and lowest ventiles. The evidence on blacks is particularly disturbing as it not only suggests differential constraints on mobility but also that black workers already assimilated into the labor market by 1957 failed to receive any relative benefits over the subsequent fourteen years, a period which spanned extensive civil rights and equal opportunity activity.

The concept of relative earnings mobility provides a new and perhaps comprehensive perspective for assessing labor market models and behavior. But it cannot yet answer all the questions we might like to ask. To distinguish still more reliably among alternative earnings models we have to answer additional research questions. In particular, we need to examine the relationship between earnings mobility and job experience. If on-the-job training is an important explanation of relative earnings mobility, then mobile workers should have distinctive firm- and industry-attachment patterns. In the same vein, it is possible that models of relative earnings rigidity are consistent with models of earnings mobility, at least insofar as the former explain the experiences of firm (industry) stayers and the latter explain the experiences of firm (industry) leavers. A data file capable of responding to this suggestion is under construction and will be the subject of a subsequent paper.

References

[1] Alexander, Arthur J. "Income, Experience, and the Structure of Internal Markets," Quarterly Journal of Economics, February 1974.

[2] Becker, Gary, The Economics of Discrimination (Chicago: University of Chicago Press, 2nd ed., 1971).

[3] Becker, Gary S., Human Capital (New York: National Bureau of Economic Research, 1964).

[4] Bergmann, Barbara R., "The Effect on White Incomes of Discrimination in Employment," Journal of Political Economy, March/April, 1971.

[5] Blau, Peter M. and Otis Dudley Duncan, The American Occupational Structure (New York: Wiley, 1967).

[6] Bowles, Samuel, "Understanding Unequal Economic Opportunity," American Economic Review, May 1970.

[7] Brofenbrenner, Martin, Income Distribution Theory (Chicago: Aldine-Atherton, 1971).

[8] Budd, Edward C., "Postwar Changes in the Size Distribution of Income in the U.S.," American Economic Review, May 1970.

[9] Conlisk, John, "Can Equalization of Opportunity Reduce Social Mobility?" American Economic Review, March 1974.

[10] David, Martin and Roger Miller, "A Naive History of Individual Incomes in Wisconsin, 1947-59" (University of Wisconsin, June 1968; mimeo).

[11] Doeringer, Peter B. and Michael Piore, Internal Labor Markets and Manpower Analysis (Lexington, Mass.: D.C. Heath, 1971).

[12] Friedman, Milton, Capitalism and Freedom (Chicago: University of Chicago Press, 1962).

[13] Furstenberg, George et al, Patterns of Discrimination (Lexington, Mass.: D.C. Heath, 1974).

[14] Gordon, David, Theories of Poverty and Underemployment (Lexington, Mass.: D.C. Heath, 1972).

[15] Haley, William J., "Human Capital: The Choice Between Investment and Income," American Economic Review, December, 1973.

[16] Henle, Peter, "Exploring the Distribution of Earned Income," Monthly Labor Review, December, 1972.

[17] Hernstein, Richard, "I.Q.," Atlantic, September, 1971.

[18] Jencks, Christopher, et al., Inequality (New York: Basic Books, 1972).

[19] Johnson, Thomas and Frederick J. Hebein, "Investments in Human Capital and Growth in Personal Income," American Economic Review, September, 1974.

[20] Kohen, Andrew I., Career Thresholds: vol. 4 (Columbus, Ohio: Center for Human Resource Research, 1973).

[21] Lillard, Lee A. "The Distribution of Earnings and Human Wealth in a Life Cycle Context," NBER Working Paper No. 47, July 1974.

[22] Lydall, Harold, The Structure of Earnings (Oxford: Clarendon Press, 1968).

[23] McCall, John J. Income Mobility, Racial Discrimination, and Economic Growth, (Lexington, Mass.: D.C. Heath, 1973).

[24] Mincer, Jacob, "The Distribution of Labor Incomes: A Survey," Journal of Economic Literature, March 1970.

[25] Mincer, Jacob, Schooling, Experience, and Earnings, (New York: Columbia University Press, 1974).

[26] Morgan, James N. et al., Five Thousand Families -- Patterns of Economic Progress (Ann Arbor: Institute for Social Research, 1974).

[27] Parnes, Herbert S. The Pre-Retirement Years (Washington, D.C.: U.S. Department of Labor, 1970).

[28] Pen, Jan, Income Distribution (New York, Praeger, 1971).

[29] Piore, Michael J., "Fragments of a Sociological Theory of Wages," American Economic Review, May 1973.

[30] Piore, Michael J., Labor Market Stratification and Wage Determination (U.S. Department of Labor, 1974).

[31] Rosen, Sherwin, "Learning and Experience in the Labor Market," Journal of Human Resources, Summer, 1972.

[32] Ruggles, Nancy D. and Richard, "The Anatomy of Earnings Behavior," mimeo, NBER Conference on Research in Income and Wealth, May, 1974.

[33] Schiller, Bradley R., "Class Discrimination vs. Racial Discrimination," Review of Economics and Statistics, August, 1971.

[34] Schiller, Bradley R. The Economics of Poverty and Discrimination (Englewood Cliffs, N.J.: Prentice-Hall, 1973). 2nd ed., 1976.

[35] Schiller, Bradley R. "Stratified Opportunities: The Essence of the 'Vicious Circle'", American Journal of Sociology, November, 1970.

[36] Schultz, T. Paul, "Long-Term Change in Personal Income Distribution: Theoretical Approaches, Evidence and Explanations," (Santa Monica: Rand, 1972.).

[37] Smith, James D. and James N. Morgan, "Variability of Economic Well-Being and its Determinants," American Economic Review, May, 1970.

[38] Soltow, Lee, Six Papers on the Size Distribution of Wealth and Income, (New York: National Bureau of Economic Research, 1969).

[39] Taubman, Paul, "Schooling, Ability, NonPecuniary Rewards, Socio-economic Background and the Lifetime Distribution of Earnings," NBER Working Paper No. 17, November, 1973.

[40] Thurow, Lester C., The Generation of Inequality, mimeo, August, 1974.

[41] Thurow, Lester and Robert Lucas, "The American Distribution of Income: A Structural Problem," A study for the Joint Economic Committee, U.S. Congress (Washington, D.C.: GPO, March 17, 1972).

[42] Wachter, Michael, "Primary and Secondary Labor Markets: A Critique of the Dual Approach," Brookings Papers on Economic Activity, 1974:3.

November 1975

THE IMPACT OF PRIVATE PENSIONS ON FIRM ATTACHMENT

By Bradley R. Schiller and Randall Weiss*

The decision of a worker to remain with a particular employer depends on a kaleidescope of economic, sociological and psychological factors. Economists naturally emphasize the monetary factors in that equation and posit that firm attachment depends on a comparison of rewards within and outside the firm: workers will remain with a particular employer only so long as the pecuniary rewards of staying exceed the pecuniary rewards of leaving. Deviations from this expectation ("statistical noise") are anticipated, of course, particularly in the presence of noncompetitive barriers to mobility, incomplete information, differentials in nonpecuniary rewards, or the most troublesome phenomenon of irrationality.

An increasingly important dimension of the comparative rewards to firm attachment is fringe benefits, particularly private pension plans. Not only are pensions becoming an increasing proportion of total compensation,[1] but they have been the recent focus of national legislation (The Employee Retirement Income Security Act of 1974) designed to assure greater security of pension benefits. In view of these developments, it seems likely that

---

*University of Maryland. Financial support for this study was provided by the Office of Research and Development, U.S. Manpower Administration and the University of Maryland's Computer Science Center; Donald Snyder and Shelley Lapkoff provided invaluable assistance in collecting and sorting the data on private pension plans, while John McNary and William T. Sutton assisted in programming and data processing.

[1] From 1950 to 1970 contributions to private retirement plans grew from 1.7 to 3.3 percent of private sector wages and salaries, while coverage increased from 25 to 45 percent of all private wage and salary workers. See Walter W. Kolodrubetz, "Two Decades of Employee-Benefit Plans, 1950-1970: A Review," Social Security Bulletin, April 1972. Because of the lack of full funding by employers of their future pension liabilities, pension benefits are more important to workers than the 3.3% figure suggests.

pension benefits will become an increasingly important determinant of firm attachment and therewith the efficiency of labor markets and even the size of the labor force itself.[2] The objective of this paper is to provide some perspective on these issues by examining the impact of specific pension plan characteristics on firm attachment patterns.[3]

This paper is organized in five parts. First, we outline the principal features of pension plans. We then briefly describe a general model of firm attachment in which the salient features of pension plans play an important part. In the third section we describe the basic data sources available for testing hypotheses generated by this model: reported pension plan characteristics for 177 of the largest private firms and Social Security earnings records for individuals who have worked for those same firms. We then describe alternative strategies for carrying out such tests and the empirical results that emerge. Finally, we attempt to assess the impact of our findings for related theory and policy. What we ultimately demonstrate is that specific features of pension plans (particularly vesting, earnings replacement, and early retirement options) strongly influence workers' attachment decisions.

---

[2] Many observers have taken note of the continuing decline in labor force participation rates of older workers, a phenomenon to which both public and private pension plans have likely contributed. The decline in participation rates for men over age 44 that has occurred since 1955 alone accounts for a five percent reduction in the size of the male labor force.

[3] We should note that very little research has been done on this question, due largely to a lack of adequate data. Taggert attempted to gauge the impact of private pension plans on firm attachment by studying the correlation between industry turnover and industry coverage; not surprisingly, his (macro) results were insignificant (Robert Taggert, "The Labor Market Impacts of the Private Retirement System," A Study prepared for the Joint Economic Committee, U.S. Congress, October 30, 1973). Parnes has used his longitudinal sample of older men to estimate the impact of pension coverage and the amount of related benefits on the retirement-decision of individual workers and found both to be highly significant (Herbert Parnes, et al., The Pre-Retirement Years: Vol. 4. Columbus, Ohio: Center for Human Resource Research, December, 1974).

I. Basic Features of Pension Plans

The most important features of pension plans are those relating to vesting, retirement ages, and benefit formulas. Vesting refers to the attainment of irrevocable rights to later pension benefits. Once vested, a worker can leave a firm and still collect pension benefits when he reaches the eligible retirement age. The size of those benefits will depend on his actual years of service with the firm, his salary during that period, and the benefit formula in effect at that time. Typically, a worker becomes vested after working a specified number of years for one firm; should he leave the firm before that time he is not vested, and thus foresakes accumulated pension credits.[4]

The size of pension benefits ultimately paid depends on the benefit formula, usually a function of years of service and earnings. A common formula takes the form $B = kY \cdot E$ where B is the monthly retirement benefit (typically constant during the retirement period), k is a constant, Y refers to years of service, and E is earnings (usually terminal or career average). Even when other formulas are used, retirement benefits usually increase with Y, due not only to increases in E, but also to periodic upward adjustments of K (or its equivalent in alternative formulas).

The last important structural features of pension plans are the age and years of service at which a worker becomes eligible for <u>early</u> or <u>normal retirement</u>. At normal retirement, defined in terms of age and/or years of service, a worker can leave his job and start to receive his full pension benefit. In most companies, the worker <u>must</u> leave his job at normal retirement eligibility, since it is also the time at which retirement is "mandatory" (permission is required to stay) or "automatic" (no such permission can be granted). In any case, the size of monthly benefits rarely increases with any years of service accrued after the normal retirement age. Most companies also define a status called early retirement, at which a worker becomes eligible for benefits, again on the basis of age and years of service, at

---

[4]Some firms provide for "partial" or gradual vesting as the years of service required for full vesting accumulate, but this is not common.

some point before the normal retirement age. If so eligible, the worker can leave his job and receive a pension benefit; the early retirement benefit is lower than the normal one, however, because accumulated years of service are fewer and because companies often actuarially reduce the benefit to take account of the longer expected life span over which it will be received.

II. The Basic Model

As suggested above, our basic model of firm attachment is predicated on utility maximization in the labor market. In particular, we assume that (1) a worker will compare the expected discounted value (EDV) of firm attachment to the EDV of alternative opportunities and (2) that the probability of voluntary exit from the firm is directly altered by that comparison. The critical components of EDV are the anticipated stream(s) of wage payments and the anticipated stream(s) of pension benefits. Thus, our basic model can be expressed as:

$$PE = f[(EDW_a + EDP_a) - (EDW_c + EDP_c)] - TC$$

where PE refers to the probability of leaving (exiting) the current employer, EDW to the expected discounted value of wage streams, EDP to the expected discounted value of pension benefit streams, the subscripts a and c to alternative opportunities (including retirement) and the current job, respectively, and TC to job transfer costs. Hence, variables which enhance EDW_c or EDP_c (or increase TC) should lower the probability of exit, while variables which enhance either EDW_a or EDP_a (or decrease TC) should increase firm exit. What interests us here, of course, is the potential for EDP to alter attachment decisions.

The major determinants of EDW_c, EDW_a, EDP_c and EDP_a for an individual worker are described in Table 1. In defining these variables we assume the worker compares two specific alternatives: (i) remaining with his current employer until "normal" retirement, at which time he can collect pension benefits, and (ii) exiting from the firm either to retire or to take another job, retiring therefrom at 65.[5] EDW_c is the second term in Table 1; wages in the current job are expected to increase at the annual rate g_c and are

---

[5] We ignore the probability of death before retirement because almost all pension plans pay death benefits to survivors. Even if the worker does not live to collect his pension, his family will receive something.

Table 1

Term	Discounted Flows	Value	Interpretation	Influence on quit Probability
(1)	$\sum_{i=1}^{65-A} \frac{W_a(Ed,A,R,O,L,U)(1+g_a)^i}{(1+r)^i}$	$W_a(Ed,A,R,O,L,U)\left[\frac{(1+r-g_a)^{65-A}-1}{(r-g_a)(1+r-g_a)^{65-A}}\right]$	Value of wages and fringes in alternative job ($EDW_a + EDP_a$)	(+)
(2)	$\sum_{i=1}^{N-A} \frac{W_1(1+g_c)^i}{(1+r)^i}$	$W_1\left[\frac{(1+r-g_c)^{N-A}-1}{(r-g_c)(1+r-g_c)^{N-A}}\right]$	Value of wages in current job (EDW_c)	(-)
(3a)	$(1-F)R(V)\ x\ \frac{1}{(1+r)^{N-A}} \sum_{i=N}^{80} \frac{B_1(W_1,Y_1)}{(1+r)^{i-N}}$	$(1-F)\,R(V)\ x\left[\frac{B_1(W_1,Y_1)}{(1+r)^{N-A}}\right]\left[\frac{(1+r)^{80-N}-1}{r(1+r)^{80-N}}\right]$	Value of benefits vested if worker leaves firm (EDP_a)	(+)
(3b)	$(F) \sum_{i=A}^{80} \frac{B_1(W_1,Y_1)}{(1+r)^{i-A}}$	$(F)\,B_1(W_1,Y_1)\left[\frac{(1+r)^{80-A}-1}{r(1+r)^{80-A}}\right]$	Value of benefits immediately available (EDP_a)	(+)
(4a)	$P(V)\frac{1}{(1+r)^{N-A}}\ x\ \sum_{i=N}^{80} \frac{B_1(W_1,Y_N)(1+g_c)^{N-A}}{(1+r)^{i-N}}$	$P(V)B_1(W_1,Y_N)\ x\left(\frac{1+g_c}{1+r}\right)^{N-A}\left[\frac{(1+r)^{80-N}-1}{r(1+r)^{80-N}}\right]$	Value of future benefits if worker stays until normal retirement age (EDP_c)	(-)
(4b)	$KP(V)\frac{1}{(1+r)^{E-A}}\ x\ \sum_{i=E}^{N} \frac{B_1(W_1,Y_E)(1+g)^{E-A}}{(1+r)^{1-E}}$	$(1-F)P(V)B_1(W_1,Y_E)\ x\left(\frac{1+g_c}{1+r}\right)^{E-A}\left[\frac{(1+r)^{N-E}-1}{r(1+r)^{N-E}}\right]$	Value of early retirement option (EDP_c)	(-)

W_a = expected wage and pension in alternative job

Ed = education

A = age

R = race

O = occupation

L = location

g = expected growth rate in wages of alternative job

r = discount rate

U = unemployment rate

W_1 = current wage

g_c = expected growth rate of wages in current job

N = age at "normal retirement," as specified in current pension plan

R(V) = 1 if vested, 0 = if not vested

$B_1(W_1,Y_1)$ = annual pension benefit for worker who retires in current year with last wage equal to W_1 and Y_1 years of service

E = early retirement age, as specified in current pension

Y_1 = current accrued years of service

F = 1 if currently eligible for retirement benefits, = 0 if not currently eligible

P(V) = probability of vesting

V = years until vesting

K = constant

Y_N = expected years of service at normal retirement

discounted at the rate r. The income term W_a, which determines EDW_a (term (1)), depends on human capital characteristics and labor market structure.

The value of the stream of pension benefits EDP_a available to a worker who leaves his present employer depends on his eligibility for immediate benefits and his vesting status. If the worker is not immediately eligible for benefits but has achieved vesting status in his present job, then he will later receive retirement benefits from his current employer even if he exits now. Note, however, that according to term (3a) those benefits no longer increase at the rate g_c, but are instead fixed by the benefit formula in effect at the time he exits. What makes this quantity (term (3a)) interesting -- and analysis of pension impact so complex -- is that vesting tends to be an all-or-nothing affair; EDP_a increases abruptly at vesting (whereupon R(V) = 1), thereby lowering the comparative value of EDV_c and increasing the probability of exit. In view of the fact that vesting requirements typically include at least ten years of service, this abrupt discontinuity in comparative EDVs is likely to have a significant effect on attachment patterns.[6] The alternative formulation of EDP_a (term (3b)) recognizes that when the worker is immediately eligible for benefits, they need not be discounted up to the normal retirement age.

Term (4a) requires some explanation. The worker knows how many years of service he will have accrued by the time he becomes eligible for normal retirement (Y_n). We assume that he estimates his own future annual benefit by projecting current benefit levels into the future, with an assumed benefit growth rate equal to g_c. The expected annual benefit thus will be: $B_1(W_1, Y_n)\ (1 + g_c)^{N-A_c}$. If we assume that the worker will live until age 80, then the value at age N of the retirement benefits will be:

---

[6] A numerical illustration shows that this term can be sizeable. A rubber worker who becomes vested (after ten years of service) and who then leaves the firm is eligible to start collecting an annual pension benefit of $660 at age 62. Assuming that the man is 40 years old, has a 6% discount rate, and expects to live until he is 80, this benefit has a present value of $1983.

$$\sum_{i=N}^{80} \frac{B_1(W_1,Y_N)\ (1 + g_c)^{N-A}}{(1+r)^{i-N}}$$

If the worker is vested, then the current value (at age A) of these benefits is:

$$\frac{1}{(1+r)^{N-A}} \sum_{i=N}^{80} \frac{B_1(W_1, Y_N)\ (1 + g_c)^{N-A}}{(1+r)^{i-N}}$$

If the worker is not vested, then he values these benefits by multiplying this term by the probability of vesting (P(v)), which is assumed to depend negatively on the number of years until vesting will be attained (v).

The last term (4b) is an attempt to estimate the value of the early retirement option to workers who are not yet eligible for benefits. This may be of value to the worker both because he may take advantage of the earlier liquidity of his pension asset and because benefits are often not subject to full actuarial reduction. Although it is difficult to value this option, we will assume that it is proportional to the value of the pension benefits the individual would receive during the years between eligibility for early and normal retirement.

All the terms in Table 1 can be substituted back into equation (1). The expected effect of each on the probability of exit is indicated in the last column of Table 1. Thus higher alternative earnings should have a positive effect on exit, and the size of the effect increases with the number of years between present age and age 65. The second term indicates that current wage should have a negative effect, which will increase with the number of years between present age and normal retirement age and with the growth rate of wages on the current job. A high probability of vesting and high benefit levels at retirement (4a) will also decrease the probability of leaving, but high vested benefits (3a) will increase this probability. For vested workers, for whom both R(V) and P(V) are equal to 1, the <u>growth</u> of the pension benefit with time and years of service (the difference between (3a) and (4a)) becomes the crucial variable; the larger this growth, the less likely it is that the

vested worker will leave. The effect of the early retirement option (4b) depends largely on the number of years over which these extra benefits may be collected.

For those workers already eligible for early retirement, a high level of benefits will make the worker more likely to leave, but this effect can be offset by a rapid rate of increase in benefits as further years of service or wage rates increase, or simply by higher current wages.

Availability of Social Security benefits can easily be incorporated into the analysis. An individual who is eligible for Social Security "early retirement" benefits but not yet eligible for private pension benefits compares the value of the Social Security benefits plus future pension benefits if he retires now to the value of future wage income and future pension and Social Security benefits if he retires at 65 or later. In either case the present value of the Social Security benefits is approximately the same, but the availability of the benefits is clearly worth something. This value is probably proportional to the Social Security benefits he would receive between now and the pension plan's normal retirement age. Suppose, for a moment, that the annual benefit was approximately proportional to current wages with coefficient d. The worth of the availability would be related to:

$$d\, W_1 \frac{(1+r-g_c)^{N-A}-1}{(r-g_c)\,(1+r-g_c)^{N-A}}$$

Note that the fractional part of this expression is equal to that of term (2) in Table 1. Adding them together gives:

$$(d-1)\, W_1 \frac{(1+r-g_c)^{N-A}-1}{(r-g_c)\,(1+r-g_c)^{N-A}}$$

Thus the coefficient of this term should be smaller (in absolute value) after eligibility for Social Security early retirement.[7]

[7] In fact, Social Security benefits are a larger proportion of wages for those with low earnings than for those with high earnings, so that this effect should be nonlinear. That is, the effect of term (2) on exit for those eligible for Social Security benefits should be lower at low wage levels, since d is higher. In addition, the first term in (1) is extremely limited, due to the earnings tests that condition Social Security benefits. If the individual is eligible for Social Security normal retirement, i.e., 65 or older, the analysis is the same except that the coefficient of W should be even smaller.

So far, our discussion has been couched totally in monetary terms, and we have assumed that all the terms in Table 1 can simply be added together. For several reasons, however, this may not be entirely appropriate. Utility maximizing individuals respond to simple present values only in the context of perfect capital markets, which can be used to rearrange income streams in accordance with desired consumption streams. But neither pension benefits nor wages can be used as collateral for borrowing. Consequently, a (discounted) dollar of pension benefits may have a different value than a dollar in wages. Also, the receipt of wages requires the expenditure of leisure, while the receipt of pension benefits does not. For both these reasons, then, we cannot anticipate that workers will respond in a perfectly linear fashion to the various monetary incentives described in Table 1.

Predictions

Although the model described in Table 1 is not fully deterministic, it should provide a solid basis for predicting the effects of changes in pension plan provisions on the probability that workers stay with the firm, holding age constant. Unfortunately, such predictions cannot be generated by a series of partial differentiations, as our model includes several discontinuous variables (e.g., R(V)). However, they can be generated by examining changes in the relevant terms. What we discuss now are the effects on firm exit of changing the early retirement age, the normal retirement age, the benefit level, and the age of vesting. None of these variables appear in the first term, so it may be ignored.

Let us first consider the effect of lowering the normal retirement age, holding other things constant, on the exit probability of an individual of a certain age. The second term will decrease since the individual's expected working life is shortened, and term (3a) will increase if the individual is vested and not yet eligible for benefits. The term (4b) will decrease because the time span over which the individual will have the option of either drawing benefits or working will be shortened (we are assuming no parallel lowering of the age for early retirement). In firms with no early retirement option,

lowering the age of normal retirement will mean that some individuals who would not have been immediately eligible for benefits are (that is, more individuals will have non-zero (3b) terms). Taken together, then, terms (2), (3a), (3b), and (4b) all diminish the comparative desirability of continued firm attachment. Term (4a), however, will increase, thus lowering the probability of exit, because the length of time during which the individual will be retired and drawing benefits will increase. This is partially offset, however, by the smaller annual benefit the worker will be able to draw because of fewer years of service and fewer years of growth in the benefit level. Accordingly, the overall impact on exit rates of lowering the normal retirement age is not clear simply from an analysis of the signs of the various terms: the levels must be analyzed, too.

Changes in the early retirement age have a much more clearcut impact than changes in the normal retirement age, partly because they affect only three terms -- (3a), (3b), and (4b). The effect picked up by (3a) and (3b) will be relevant only for the oldest age groups: raising the early retirement age will mean that some individuals will lose immediate eligibility for retirement benefits and will thus be less likely to leave the firm. For the other groups, however, the term (4b) increases because of the shortening of the length of time during which the individual may have the option of drawing early retirement benefits. Note, however, that this shortening of the time span may be somewhat offset by the additional annual benefit resulting from greater years of service and general growth in benefit levels. In any case, raising the early retirement age for this younger group will make them more likely to leave the firm.

Changing vesting requirements will affect terms (3a), (4a) and (4b). Raising the age of vesting for workers of a given age will decrease the values of terms (4a) and (4b) by lowering the probability of vesting and thus the value which workers put on future pension benefits. At the same time, however, raising the age of vesting will decrease term (3a) since R(V) will be equal to 0 for a greater number of workers. For workers for whom the new vesting age is close to their current age, this decrease will outweigh the decreases of

(4a) and (4b), so that their ties to the firm will be increased. For younger workers, however, raising the vesting age will decrease the relative attractiveness of the current job.

The last pension feature which we consider in this section is the benefit level. Intuitively, increases in the benefit level should increase the desirability of leaving the firm for those immediately eligible for benefits and decrease it for others, and the equation partially confirms this. For those currently eligible for early retirement benefits, an increase in the benefit level increases the value of what is currently available (3b), but it also increases the value of what will be available if the worker waits until normal retirement age (4a). If the gain in benefit level with years of service is sufficiently rapid, then (4a) could be greater than (3b), in which case a general increase in the benefit level could decrease the incentive for leaving the firm. For those not immediately eligible for benefits, the general increase in benefit level will be certain to increase the desirability of the current job, since the increase in (4a) will always be larger than the increase in (3a). In addition, (4b) increases when the benefit level increases.[8]

Workers who are about to be forced out of their jobs by automatic retirement have no alternative; they will be removed from our sample because they are not part of the probabilistic model we are dealing with. Their turnover will be counted, however, when the total impact of pension plans is assessed.

We should emphasize that the complexity of our predictions is attributible to the unique structural features of most private pension plans. In the typical American plan, the expected discounted value of pension benefits (EDP) varies unevenly over a worker's career. The holding power of

---

[8]It should be emphasized that this discussion is relevant only for proportionate increases in benefits that do not change the structure of the benefit formula. If these patterns are changed, of course, additional analysis of the effects would be required.

private pension plans is especially strong just before vesting and in the few years prior to retirement eligibility, and our analysis is designed to capture this effect on firm attachment patterns. We should note, however, that plans could be designed to eliminate such discontinuities, e.g., by making the increase in EDP_c a fixed proportion of wages with immediate full vesting.

67

III. The Data

In order to develop empirical estimates of the impact of private pension plans on firm attachment we must be able to identify the plans associated with specific firms, and to measure the extent of firm attachment (or employee exit) over time. To satisfy these needs we have drawn on two basic data sources: (1) the U.S. Department of Labor's file of private pension plans and (2) Social Security Administration (SSA) records of individual earnings.

The pension files are maintained by the Labor and Management Services Administration (LMSA) of the U.S. Department of Labor and contain detailed information on the provisions and status of all private pension plans covering 100 or more workers. By law (the Welfare and Pension Plans Disclosure Act of 1958), firms are required to report all significant changes in such plans, thus continuously updating the file. From this file we have selected those plans offered by 177 large firms, chosen on the basis of size and availability of pension plan data. The firms range in (1970) size from 550,000 domestic employees (General Motors) to 11,200 employees (Rohr Industries) nearly all of them on Fortune's lists of the largest companies. For each firm we have identified the major provisions of its plan(s) as of 1970, as well as noting major changes prior to that time. Where more than one pension plan was offered by a firm, we focused on the major plan (in terms of coverage) while identifying structural differences among alternative plans.[9]

The pension plan provisions which we have tabulated include the age and service requirements for vesting, early and normal retirement, the presence of automatic retirement, the formula relating the amount of pension benefits to the worker's years of service and salary, the contributory status of the plan, and any supplemental or optional plans to which the employee may contribute.

---

[9] It is quite common for large firms to have separate plans for hourly and salaried employees, although the major structural features are often similar. In a later section of this paper we distinguish among the plans offered by a single firm.

We have used the Social Security Administration's (SSA) earnings records to identify employees of the firms in our sample. Specifically, we have used SSA's one-percent LEED (Longitudinal Employer-Employee Data) file to identify one percent of all the male employees who worked for our sample firms at any time during the period 1957-71. For workers whose earnings are greater than the Social Security payroll tax base in any given year, the data contains an estimate of annual earnings derived from earnings in the quarter before this ceiling was reached. Thus, we can count the number of years that a worker has been employed by his current employer and the amount of wages he was paid each year. In addition, information is given on the age and race of the worker and the industry and county of the employer.

From the group of workers employed at any time by one of our sample firms we have eliminated those with only marginal attachment. In particular, we restrict our inquiry to those workers for whom one of our sample firms was the major employer (as gauged by wages paid) in at least one year of the observation period and who accumulated at least one full year of the experience with that employer. These criteria are intended to eliminate from consideration those short-term employees for whom pension-plan provisions are likely to be irrelevant. Our resultant sample includes approximately 60,000 workers.

The dependent variable in our analysis is the annual firm exit rate. This is obtained from the LEED file by noting when a worker stops receiving wages from one of our sample firms. Our determination of exit in year n is based on observing (1) a worker changing major employer in year n or (2) no evidence of employment in year n+1 with his (unchanged) major employer.

A potential important problem with the SSA data should be mentioned at this point. Although our theoretical discussion has concerned the motives for voluntary job changing by workers, our data does not distinguish between voluntary and involuntary turnover (quits and layoffs). In general, this should not be a great problem, however. A study by Hall (BPEA, 1972:3) of men aged 45 to 54 indicates that job changers are more than twice as likely to have quit than to have been laid off. On the other hand, firms may find it profitable to lay off workers who are just about to become vested in order

to minimize pension costs. Of course, this would lower workers' estimates of the probability of vesting (P(V)), and lead them to put very little value on pension benefits in assessing the advantages of staying in their current job. This data problem, rather than a deficiency of the model, could be responsible for a finding that unvested workers are not influenced by pension plans. In unionized firms, seniority rules governing layoffs make this practice unlikely, so the unionization data we describe below will help minimize the influence of this problem.

To determine the extent of unionization within each firm, we have used U.S. Department of Labor files to construct estimates of the number of union members in each of our firms. Combining this information with employment figures from Fortune and other sources we can estimate the percentage of employees in each firm who are union members for the late years of our sample. We also link industry information from the LEED file with Fuchs's (1968) industry unionization figures, since the power of a union in raising its members' wages above those of non-unionized firms is likely to depend on industry, as well as firm, union coverage (Rosen (1969)).

A second constraint imposed on our model-testing by the data set is the lack of information on alternative wage opportunities (EDW_a). The LEED data file contains no information on a worker's education or occupation, variables that might be used to estimate EDW_a. Accordingly, we are led to draw on census crosstabulations of industry, occupation, and education to approximate EDW_a in our later tests.

IV. Empirical Tests and Findings

Although our data sources are unusually rich, they do not completely meet the requirements of our underlying model. Accordingly, we employ several different strategies in seeking to confirm our basic hypotheses. Our tactical approach is to sequentially trade off sample size for increasing precision of data specifications. Thus, we begin our analyses by examining firm and cohort-specific characteristics for our entire sample of 177 firms and 60,000 workers, an exercise that yields preliminary estimates of the relationship between pension-plan characteristics and firm attachment. Subsequent reductions of the sample are necessitated by our attempts to focus on individual, rather than firm-average exit rates and to satisfy more completely all the restrictions of our model. As each test is designed to address one or another limitation of the data set, their cumulative impact serves to bolster confidence in the findings that emerge.

A. Firm Exit Rates, Cross-section

Our first test of the basic model uses observations on individual firms; our dependent variable is the firm's 1966 exit rate for workers of specified age cohorts. Exit rates in our sample varied widely around the overall mean of 10.78 percent, as Table 2 indicates. On the one hand, of course, there is tremendous variation across age cohorts, with the youngest and oldest cohorts exhibiting the greatest exit tendencies. But there is also tremendous variation across firms in cohort-specific rates as evidenced by the very high standard deviations. It is the latter kind of variation that we seek to explain with Test A.

For the purposes of this first test we have constructed a series of dummy variables to represent the major features of each firm's pension plan. As our underlying model suggests, we focus on the availability of vesting,

Table 2. Cohort-Specific Rates, 1966

Cohort	Firm-Specific Exit Rate	
	Mean	Standard Deviation
under 35	18.52	10.60
35 - 39	8.33	10.05
40 - 44	6.11	8.06
45 - 54	4.86	5.27
55 - 61	5.66	8.28
62 - 64	16.63	20.84
65+	54.54	35.20
Total	10.78	5.68

the age of normal retirement, the availability of an early retirement option, pension benefit levels, and the earnings replacement rate. Table 3 describes these variables and summarizes the expectations generated by our model. Note that we use a plus sign to indicate factors that encourage exit (discourage

Table 3

Anticipated Effects on Firm Exit Rates[1]

Plan Provisions	Age Cohort							Number of firms
	under 35	35-39	40-44	45-54	55-61	62-64	65+	
EV: early vesting; available before age 40[2]	-**	-	0	0	0	0	0	27
SV: standard vesting; available between ages 40-44	-*	-**	0	0	0	0	0	79
LV: late vesting; available only at age 45 or older	0	-*	-**	0	0	0	0	67
EN: early normal; available age 62 or less	0	0	0	-	-	+	+	20
MN: minimum normal; available age 62-65 with short service requirement	0	0	0	0	-	0	+	142
ER: early retirement option	0	0	0	-	+	+	0	189
AR: automatic retirement	0	0	0	0	0	0	+	84
BL benefit level	0	0	0	-	-	-	+	

[1]The dependent variable in each equation is the cohort-specific exit rate for individual firms; see text for explanation.

[2]Vesting requirements are expressed in terms of age, years of service, or some combination of both. To standardize plans across firms we have converted service requirements into age equivalents by adding service requirement to the observed average age of firm entrants.

74 74

16x

attachment), a minus sign for mobility-inhibiting factors, and a zero for factors that are unlikely to influence the attachment decision of specific cohorts. As implied by the basic parameters of our model, we expect the effect of any particular pension-plan characteristic to vary with the age of the relevant cohort.

Our expectations for each of the included vesting variables is conditioned on the alternative of no vesting (a situation which applies to twenty of our sample firms). Thus, for example, we expect the availability of early vesting (EV) to constrain the exit of the youngest cohort, as there is an imminent pay-off to further attachment for this group, a reward that would not exist in a no-vesting situation. Standard vesting (SV) should have a similar effect, though not quite so significant, as vesting is further away. Finally, we would expect late vesting (LV) to have the least constraining effect on the exit of this cohort due to its remoteness in time. We have indicated the anticipated relative strength of these three vesting options with asterisks. Our expectations for other cohorts are similarly designated.[10]

Our expectations for early normal (EN) and minimum normal (MN) are both conditioned on the alternative of standard normal retirement eligibility at age 65 with more than ten years of service. Thus, both EN and MN reflect more liberal eligibility for normal retirement benefits. Naturally, we expect them to inhibit the exit of those approaching relevant eligibility ages and increase exit among those already eligible.

---

[10] Note that we have hypothesized zero coefficients on SV for the cohort aged 40-44 and on LV for the cohort aged 45-54. This results from the fact that many individuals in each of these cells will be very close to vesting attainment (and thus strongly attached to the firm), thereby offsetting the positive impact of vesting on exit for those individuals within each cell who have attained vesting. Test 3 takes explicit account of such intra-cell variation.

The expectations vis-a-vis early retirement (ER) and automatic retirement (AR) provisions are gauged in relation to the absence of such provisions. Finally, higher benefit levels are expected to exercise a magnetic effect on workers until eligibility is achieved.

Pension provisions are not, of course, the only factors relevant to firm attachment decisions that differ across our sample of firms. On the contrary, we recognize that our sample firms differ in size, growth, level of wages, degree of unionization, and in other ways that may affect firm attachment.[11] Accordingly, we want to control for as many of these factors as possible in seeking to determine the independent influence of pension provisions. In our empirical tests, we thus include the following additional variables as explanations of firm-specific exit rates:

- AW: Average wage
- GW: Growth in firm's average wage, for specific cohort, 1965 to 1968
- GE: Growth rate of employment, as measured by number of employees in 1965 and 1969
- R: Racial composition (proportion of blacks)

We should note that the availability of Social Security benefits is partially controlled for by our specification of age cohorts: workers in the cohort aged 62-64 are those who may be eligible for early SSA retirement benefits; those in the oldest cohort are eligible for full benefits.

Our first test of the pension model consists, then, of eight regressions, each seeking to explain variations in cohort-specific exit rates among our sample of 177 firms. Because many of the firm- and cohort-specific cells are quite small, we have endeavored to eliminate spurious variation

---

[11] It should be noted that the existence of pension plans is highly correlated with firm size, average wage, and unionization (see Emerson Beier, "Incidence of Private Retirement Plans," Monthly Labor Review, July 1971). In effect, then, we are limiting ourselves to an analysis of pension-plan impacts among a unique subsample of all firms.

by weighting the cells by the number of individuals they contain. Table 4 summarizes the results of this effort. In general, the results confirm many of our predictions, although they also include some inexplicable relationships.

The vesting variables (EV, SV, and LV) tend to be the best performers, in the sense of confirming our model's predictions. In general, the availability of vesting does appear to increase firm attachment as the last column of Table 4 attests: vesting options reduce exit rates by three to four percentage points. Notice the cohort aged 35-39, in particular, where vesting is imminent and appears to constrain firm exit significantly. This age group may be of special importance, not only because they are approaching vesting eligibility under many plans, but also because they are likely to be at the career juncture where long-term commitments are being considered. From this perspective, a drop in the firm exit rate amounting to six percentage points is not only statistically significant, but institutionally important as well.

What is disappointing about the vesting coefficients is their failure to attain statistical significance for a couple of critical cohorts, particularly the 40-44 cohort. These workers are close to the "late vesting" (LV) option, and would seem to be powerfully influenced by the calculation of expected pension rights (EDP). If our results are reliable, they may imply that workers make "final" firm and career commitments prior to this age.

The most troublesome results reported in Table 4 are those relating to "Early Normal" (EN), "Minimum Normal" (MN), and "Early Retirement" (ER). EN refers to the availability of normal retirement benefits at age 62 or less, MN refers to their availability at age 62-65 with a relatively short service requirement, while ER signals availability of reduced benefits at earlier ages, chiefly 55-60. As our model suggests, we expect such provisions to influence strongly the exit decisions of older cohorts. And in this respect we are heartened by the findings that (1) EN increases exit among workers aged 62-64 by over thirteen percentage points, and (2) ER

77

PRELIMINARY

Table 4

Regression Results, Test A

Independent Variables	Age Cohort							Total
	under 35	35-39	40-44	45-54	55-61	62-64	65+	
Pension-related:								
EV	-4.06	-6.32**	- .91	.48	.62	-11.77*	14.93	- 3.34*
SV	-4.87*	-6.09**	-2.15	-2.27*	-2.21	- 3.13	11.46	- 4.24**
LV	-4.04	-3.40	- .08	- .97	- .91	- 4.35	10.64	- 2.93*
EN	9.55**	2.52	1.80	3.10**	2.42	13.12**	6.40	5.75**
MN	3.82**	.95	.66	.97	.04	.19	7.17	2.41**
ER	26.39**	15.46**	11.17**	7.53**	5.96**	3.32	11.17	13.24**
AR	.09	- .16	-1.22	- .34	- .78	- 2.38	2.84	- .13
BL	- .01	- .00	- .01	- .01	- .02*	.02	.11*	- .008**
Controls:								
AW	- .00	- .00	.00	.00	.00	.00	.00**	.00
GW	.51	-1.70	- .24	.37	.68	2.63**	5.79*	- .15
GE	-2.09**	- .82	- .69	- .76	-1.03	5.68*	4.69	- .91**
R	.31**	.04	.12*	.05	.07	- .20	.27	.20**
Constant:	.00	1.51	-.55	-.22	-1.20	.23	-11.28	- .49
R^2	.52	.19	.16	.27	.38	.55	.50	.55
Number of firms:	177	175	173	175	173	150	111	177

* significant at .05 level

** significant at .01 level

78 78

19x

increases exit among eligible workers (aged 55-61) by nearly six percentage points. What troubles us about these variables is the significance and size of their coefficients for younger cohorts, for whom retirement age provisions would seem to be irrelevant.

The size of a firm's (standardized) monthly retirement benefit appears to have some impact on exit rates, in the expected direction. For the cohort aged 55-61, the promise of higher benefit levels appears to restrain firm exit, by approximately .02 percentage points for every dollar of increased benefits. Higher benefits have the opposite effect on those already eligible for retirement, however, as witnessed by the coefficient on BL for the 65+ cohort: apparently, an added dollar of monthly benefits increases the exit rate of this cohort by .11 percentage points.

Our control variables exhibit no consistent relationships across individual cohorts, although there is a tendency for blacks to exit more frequently than whites and for growing firms to retain a higher proportion of their workers. The former relationship may be due to the fact that blacks tend to be more restricted to industries and firms that exhibit less employment stability or simply to the fact that they tend to act or be treated differently in any given firm or industry.

B. Individual Exit, Cross-section

Although test A provides considerable support for our basic model, its specifications are far from perfect. A basic weakness of Test A is that it does not account for variation in the pension status of individual cohorts. Yet it is likely that both interworker and interfirm variation exists, thus interjecting considerable statistical noise into our results. If we can account for such variation explicitly, we should be able to obtain stronger results.

Ideally, we want to ascertain the exact pension status of an individual by plugging his service and earnings history into the eligibility and benefit formulas of his firm. We are constrained, however, by the fact that the LEED employment record is only fifteen years in length and provides no clues about work experience prior to 1957. In view of the fact that service requirements for either vesting or normal retirement often equal or exceed fifteen years, this data limitation is serious.

The longitudinal limitations of our data can be circumvented to some extent by limiting our observations to those firms with comparatively short service requirements for vesting or retirement eligibility and concentrating on the later years of our observation period. A total of 78 firms in our sample have service requirements for vesting and normal retirement of ten years or less. Accordingly, for the period 1968-1970 we can determine whether or not any particular worker in these firms is vested or not and whether or not he is immediately eligible for retirement benefits. For individuals not so eligible, we can also estimate the following variables:

YTV: the number of years until vesting is attained

YTER: the number of years until early retirement

YTNR: the number of years until normal retirement eligibility

For all workers who have achieved vesting or retirement eligibility, these variables are equal to zero; such workers are additionally identified as being vested (IV), eligible for early retirement (IER), or eligible for normal retirement (INR).

The distinguishing feature of Test B, then, is our ability to measure the proximity of vesting (or eligibility) for individual workers, a measure which substitutes for the dummy variables used in Test A to represent a firm's pension-plan characteristics (and to approximate an individual's pension plan status). As our basic model (Table 1) implies, we anticipate that the holding power of vesting (or retirement eligibility) provisions increases as years of service or age accumulate, at least until vesting (or eligibility) is attained. Accordingly, we anticipate that the proximity of vesting (or eligibility) -- i.e., lower values of YTV, YTER, and YTNR — will restrain exit rates. Such a finding would be consistent with our Test A results, which suggest that more liberal vesting or eligibility provisions reduce firm exit rates.

In testing the significance of these variables we have run separate regressions for our total (sub)sample as well as for each age cohort, using much the same control variables earlier employed. Note that we continue to employ the firm's average pension benefit (standardized for $6,600 of base wages and thirty years of service) as the only measure of pension benefits levels. We are compelled to do this because of our lack of knowledge about years of accumulated service prior to 1957, thus, we cannot compute total service or anticipated benefit levels for all the

individuals observed in Test B. We will overcome this constraint in our next test by reducing the sample further, specifically to those who entered one of our firms in 1957 or later. Note also that we have added one potentially important control variable, namely the individual's earnings (IW) in the preceding year.

Table 5 displays the results of our second test, based on observations on 25,728 individuals employed by our subsample of 78 firms. Note that we are using a dichotomous dependent variable in this test to indicate whether or not an individual exited from a firm in each observation year. Hence, the regression coefficients may be interpreted as the changed likelihood of exit due to specific characteristics of the individual or firm; the average exit rate--the naive probability of exit--was 19.1 percent. The coefficients of principal interest in Table 5 are those on YTV, YTER, YTNR, IV, IER, and INR.

Beginning in the last column of the table, we may note that nearly all of the pension-related variables are significant and consistent with our expectations. Thus, for example, we find that the closer a worker is to attaining vesting, the less likely he is to leave the firm: each year closer to vesting status lowers the probability of exit by .67 percentage points. Once vesting is attained, however, there is no demontrable exodus from the firm, as the (insignificant) coefficient for IV documents. As we noted in the discussion of our model, this latter result is quite explicable, so long as pension benefit formulas incorporate fast-growing rewards to continued attachment (i.e. so long as g_c is sufficiently large).

Table 5

Regression Results, Test B

Independent Variables	Age Cohort							
	under 35	35-39	40-44	45-54	55-61	62-64	65+	Total
Pension-related:								
YTV	.0027**	.0060**	.0051*	.0120**	.0018	.1192	----	.0067**
YTER	-.0133**	-.0047	-.0044	-.0062**	.0149*	.0084	----	-.0027**
YTNR	.0012	.0016	-.0032	.0027	-.0037	-.0843*	-.0249	.0032*
IV	.0273	.0148	-.0282	.0112	-.0127	.4528*	----	-.0103
IER	----	----	----	----	.0769**	-.1895	----	.1038**
INR	----	----	----	----	----	-.0415	.1686	.2798**
BEN	-.0005**	-.0005**	.0001	-.0002*	-.0005*	-.0004	-.0025**	-.0004**
Controls:								
IW ('000s)	-.0225**	-.0005**	-.0030**	-.0003	.0013	-.0090**	-.0043	-.0044**
GW	-.1445**	.0258	-.1057*	-.0804	.0075	.0164	-.0678	-.0665**
GE	.0382**	.0048	.0212	-.0178	-.0532**	-.0605	-.0033	.0168**
R	.0074	.0091	.0227	-.0067	.0047	-.0731	-.0670	.0120
Union	.0101	-.0524*	.0180	-.0045	-.0084	-.0752	.0483	-.0083
Age	-.0212**	-.0053	-.0092	-.0039	.0157**	-.0490	-.0713**	-.0008
Constant:	1.5526**	.5186	.7932*	.4765*	-.6446*	3.4987*	5.6219**	.3334**
R^2	.058	.017	.015	.010	.016	.048	.134	.033
N	8425	3146	3467	6667	3115	656	252	25,728
Mean Exit:	.242 (.428)	.165 (.371)	.154 (.361)	.144 (.351)	.173 (.378)	.303 (.460)	.528 (.499)	.191 (.393)

* significant at .05 level ** significant at .01 level

Examining differences across age cohorts, we find that the coefficient on YTV is uniformly positive, and nearly always significant. The largest impact of YTV occurs in the 45-54 cohort, where every year closer to vesting reduces the probability of exit by 1.20 percentage points. The attainment of vesting itself (IV) appears to significantly affect the behavior of only the 55-61 and 62-64 cohorts where vesting increases exit probabilities substantially.

Our coefficients on YTNR and INR also support our basic hypotheses. A worker who is many years from attaining normal retirement eligibility is prone to exit from the firm, probably because he attaches low values to surviving and/or staying with the firm until eligibility. As normal retirement draws near, however, exit rates decline until normal retirement eligibility is actually attained, at which point the probability of exit increases dramatically.

Proximity to early retirement (YTER) does not have the same kind of exit-inhibiting effect as proximity to vesting (YTV) or normal retirement (YNR), at least not for the sample as a whole. But YTER does behave as predicted for the 55-61 cohort, for whom early retirement options are most relevant. Indeed, the attainment of early retirement (IER) increases exit substantially for this cohort.

The last pension-related variable included in Test B is the level of typical firm-specific pension benefits (BEN). As anticipated, we find that the promise of higher benefits tends to reduce firm exit for most cohorts. To our surprise, however, we find that higher benefit levels apparently inhibit exit among the oldest cohort as well.

Turning to our control variables, we find that higher wages (IW) clearly inhibit exit, as both our model and intuition suggest. Only the middle two cohorts (45-54 and 55-61) are insignificantly influenced

by IW, their behavior being more directly affected by the proximity of vesting and early retirement.

The rates of firm-specific wage and employment growth both affect firm attachment, but in opposite directions. High rates of wage growth are most important to the youngest cohort, which confronts the largest period of future employment: here we find that an increase of one percentage point in the rate of wage growth reduces firm exit by .001 percentage points. By contrast, higher rates of employment growth appear to discourage attachment among the young, a result we find surprising in view of the fact that rapid firm expansion would seem to provide more opportunity for upward mobility. We do find, though, that rapid employment growth tends to inhibit exit among older workers (age 55-61), probably because of the implied increase in managerial responsibilities and status.

Neither race nor union status appear to influence individual exit probabilities. We are led to urge extreme caution in interpreting the union variable, however, for three reasons. First, we have not identified and individual's union status, but only the degree of unionization (in percentage terms) for his firm. Second, we are skeptical about the completeness of the union data obtained from Bureau of Labor Statistics files. Third, many of those attributes of unions that might influence firm attachment are explicitly incorporated in our model. To the extent that unions have stimulated such pension-related characteristics, the impact of unions on firm attachment may be understated.

Myopia Hypothesis

It is possible that pension provisions exert a still stronger influence on attachment decisions than the results of Table 5 imply, but not in the rational, continuous manner hypothesized by Test B. In our description of the model we emphasized the discontinuity in comparative EDVs that occurs at the moment vesting is achieved (due to the abrupt change from R(V) = 0 to R(V) = 1 in our definition of EDP_a). This implies that our proximity variables (YTV, YTER, and YTNR) may conceal critical junctures in the firm attachment decision; in particular, that we should separate out (1) those who are close to vesting (or eligibility) and (2) those who have recently attained vested status (or eligibility). To do so, of course, is to suggest a degree of myopia -- or irrationality -- in the calculation of comparative EDVs. What we are suggesting is that workers may not give any thought to the loss of EDP bound up in firm exit unless they are very close to vesting (or eligibility). This suggests that the relationship between YTV (or YTER or YTNR) and exit is nonlinear. It may also be the case that the increase in mobility potential that vesting (or eligibility) implies, is also nonlinear, i.e., that workers make comparative EDV calculations only at critical junctures and not continuously thereafter.

To examine this possibility we have substituted six additional variables into Test B, namely:

2YTV: individual within tow years of attaining vesting

2TPV: individual attained vesting within last two years

2YTER:
2YPER: defined as above, with respect to early retirement

2YTNR:
2YPNR: defined as above, with respect to normal retirement

As noted earlier, the truncated nature of the LEED record precludes us from calculating total years of service for workers whose firm attachment began prior to 1957. Accordingly, we cannot specify the above variables for such workers, but must instead limit our observations to those workers who entered one of our sample firms in 1957 or later. Thus, our myopia hyposthesis is tested on a subsample of the workers observed in Test B; 16,271 individuals are included.

Table 6 displays the results of this test.

Table 6

Myopia Test

Independent Variables	Cohort Aged 45-64		Cohort Aged 55-61	
	Linear Test	Myopia Test	Linear Test	Myopia Test
YTV	.0103**		.0189	
YTER	-.0033		.0031	
YTNR	.0088*		.0027	
IV	.0295		.0178	
IER	----		.0648	
BEN	-.0003	-.0003	-.0004	-.0004
^{2}YTV		-.0293		-.0590
^{2}YPV		-.0286		-.0536
^{2}YTER		-.0260		-.0101
^{2}YPER				.0918*
R^2	.011	.007	.030	.029
N	2788	2788	1059	1059

Note that we have displayed the results for only two cohorts and omitted the coefficients for all control variables. Our purpose here is simply to determine whether or not the myopia (nonlinear) variables provide a <u>better</u> explanation of firm attachment patterns than our earlier (linear) pension variables. Apparently, this is not the case. Not only do most of the myopia coefficients fail to attain statistical significance, but they do not yield any higher explanatory power (R^2) for the model as a whole.

V. Summary and Conclusions

Our analysis of the relationship between pension plan characteristics and firm attachment patterns clearly demonstrates that private pension plans are an important insitiutional determinant of labor supply and utilization patterns. In general, we have found that the promise of vesting or (early) retirement eligibility or the promise of higher retirement benefit levels tends to increase firm attachment (reduce exit) among those who are approaching such status, while the attainment of retirement eligibility and the immediate availability of higher retirement benefits tends to diminish attachment (increase exit) among affected workers.

While it is difficult to summarize all of our findings for different age cohorts and pension plan characteristics, it is worth noting that the impacts we have identified are often quite substantial. We noted, for example, that the firm exit rate for the 35-39 cohort falls by 6.09 percentage points when a standard vesting option (e.g., 40 years of age, with 10 years of service) is introduced into a previously no vesting situation. Likewise, we also noted that every additional dollar of monthly retirement benefits reduces the exit rate of the 55-61 cohort by .02 percentage points, while it increases the exit rate of the 65+ cohort by .11 points. In view of the fact that typical monthly benefits ranged from $75 to $330 per month for our sample, these influences on firm attachment may be very large.

Our ability to draw inferences about general labor market behavior from our study is limited by the nature of our sample, namely the largest companies, which have at least some form of a pension plan. But if it seems reasonable to suggest that if firm attachment decisions are significantly affected by <u>differences</u> in pension plan characteristics, then such decisions are likely to be even more dependent on the existence of such plans. That is to say, we have effectively limited our discussion to the <u>marginal</u> changes in labor supply associated with pension plan changes; presumably, the <u>total</u> impact of private pensions is much larger still. What this implies is that the labor mobility required for productive efficiency may be seriously constrained by the institutional pehnomonon of private pension plans.* More to the point of current policy discussions,

* But it is also possible that dynamic efficiency is enhanced by the greater security afforded both workers and employers, i.e., that the implied mutual commitment expressed in pension plans increases a worker's productivity and an employer's training efforts.

we may also note that the more generous pension provisions now required by law may further constrain allocative efficiency.

The macroeconomic losses implied by pensions may be contrasted with microeconomic gains. Our findings also suggest, for example,that employers can recover some or all of the costs associated with more generous pension provisions through the implied reduction in employee turnover, at least among prime-aged workers. We have also noted that desired reductions in employee turnover can often be attained more cheaply through the promise of higher retirement benefits than through higher current wages.* Finally, as our underlying model of rational, maximizing behavior implies, the welfare of covered workers may be enhanced by more generous pension plan provisions.

* The implied trade-off between wages and pension benefits is examined in a separate paper.